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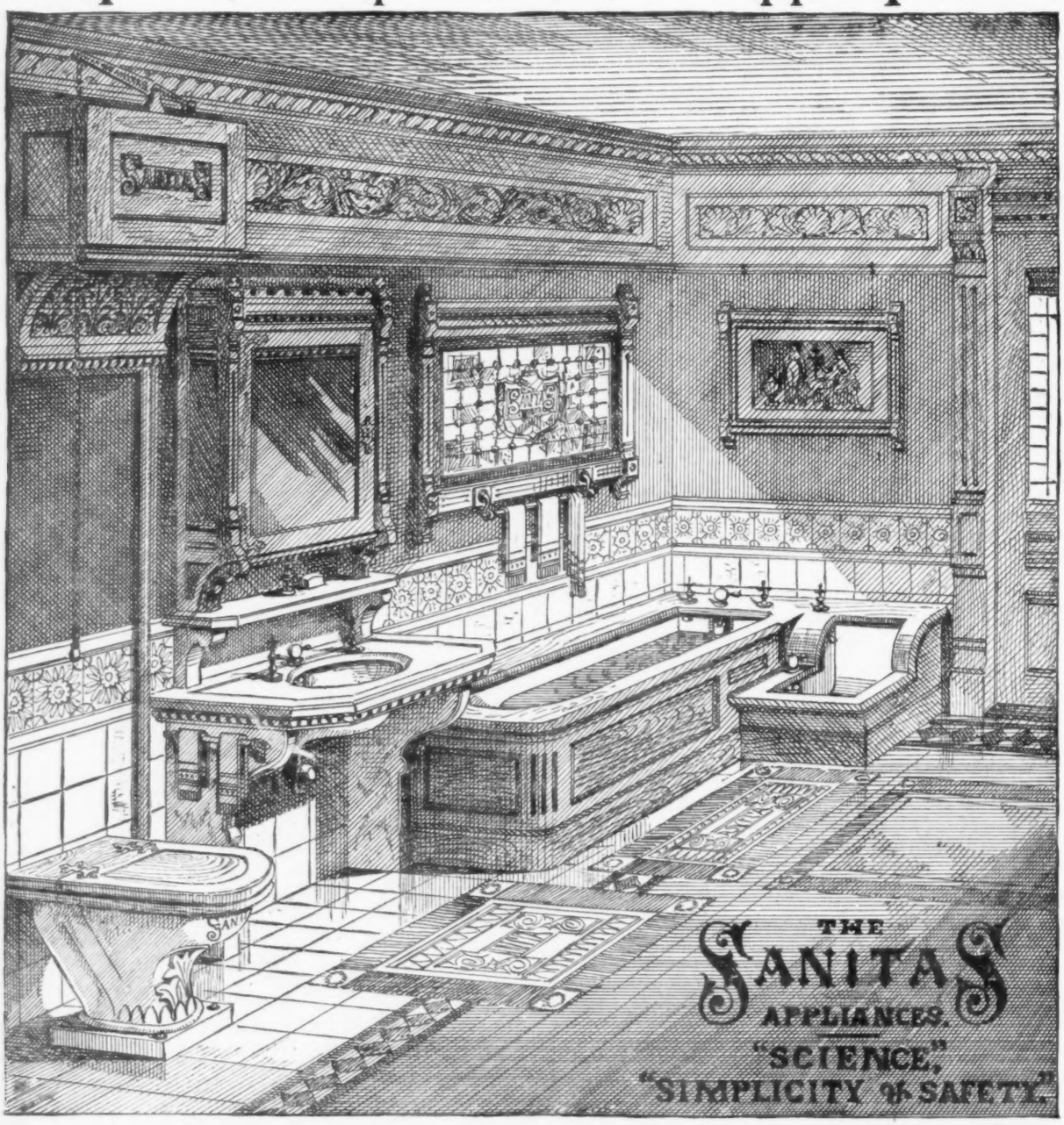
VIEW OF BATH-ROOM FITTED UP WITH THE

SANITAS PLUMBING APPLIANCES



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THE Twenty-first Annual Convention of the American Institute of Architects will take place in Chicago, on Wednesday, Thursday, and Friday, October 19, 20 and 21 next. The full programme of the proceedings is not yet ready, but the Convention is in the hands of an admirable committee, and there can be no doubt of its success. Among other things, it is proposed to have a much more complete exhibition of the works of members than has ever yet been attempted, and an earnest invitation is extended to all who have photographs or drawings of buildings executed by them within the last ten years to forward them, for exhibition first at the October Convention, and then, by request of the Western Association of Architects, at the convention of the latter body, which takes place in November. We wish that the meetings of the architectural societies could be held in winter, instead of in the busiest season, with, perhaps, the exception of the early spring months, in the whole year; but to those who have leisure for the journey, the middle of autumn is a very pleasant time to see new places, and Chicago, particularly, will be almost at its best then. The Western Association has courteously appointed its President, Mr. Root, its ex-President, Mr. Adler, and its Secretary, Mr. Alexander, to represent it in the Convention, and the meeting ought to be unusually interesting and important.

MR. DETLEF LIENAU, one of the oldest practising architects in the country, died in New York on the twenty-ninth of August last, after a short illness. Mr. Lienau was a Dane by birth, but was educated in Germany, completing his training as an architect in Paris, under the great Labrouste. Soon after this he came to New York, establishing himself in practice at a time when architects were few there, and their employment rather uncertain. He soon secured reputation and employment, and his painstaking fidelity to detail gradually made him an authority in matters of construction, so that, while carrying on his private business, he was for many years one of the most trusted members of the Board of Examiners constituted by the New York law as a tribunal of appeal from the decisions of the Inspector of Buildings. Although quiet and unobtrusive in disposition, and unable, through the distance of his residence from New York, to take a very active part in the proceedings of the architectural societies of the city, he was greatly interested in all movements for the good of the profession, and was one of the first members of the American Institute of Architects, repeatedly holding office, if we are not mistaken, in the New York Chapter.

THE burning of the Exeter Theatre, in England, by which nearly two hundred persons lost their lives, has called renewed attention to the dangers which those who enter theatres are compelled to face, and renewed inquiry as to the means of avoiding them. The history of the Exeter fire does not seem to have been very different from that of other catastrophes of the kind. The stage happened to be encumbered with an unusually large amount of scenery, which was in course of preparation for a pantomime. This caught fire, sending torrents of smoke into the auditorium; the audience tried to rush out, but there was only one door, and those who had farthest to go to reach it were kept back by the struggling crowd until they were suffocated, and the flames burned their dead bodies beyond recognition. The town firemen tried to do something to check the fire, but found their efforts useless, and were obliged to content themselves with rescuing a few of the fugitives; and one of the most skilful fire-engineers in England, on viewing the scene of the conflagration, remarked that any fire-service that could have been provided in the building would have been powerless against the effect of the sudden combustion of so much inflammable matter. This opinion, which was probably well founded, is in striking accordance with the observation made by an officer of the Paris fire-guard, which, we may remember, is a picked body of soldiers, drilled and exercised to perfection. This gentleman, speaking of the precautions against fire which the law requires in theatres, and particularly of the firemen always stationed on the stage in Paris, said that the only real use of these men was to reassure the audience, which felt itself safer in sight of their uniforms. "If," he continued, "a serious fire should break out behind the scenes, their skill and courage, aided by the appliances for drenching the stage with water, which are lavishly provided in French theatres, would be of no avail whatever." Such a man would not speak without knowledge, and would be likely to know thoroughly what he was talking about; and, strange as his opinion seems to those who remember the lines of coiled hose, the automatic sprinklers, the water curtains, and the thousand and one fire-extinguishing appliances of modern theatre construction, it must be acknowledged that the history of recent theatre fires confirms it. It cannot be too often repeated, that smoke, not fire, is the fatal agent in such cases, and this acts very quickly. To cite again some curious statistics on the subject, the average time that elapses between the appearance of fire inside the proscenium arch, and the total extinction of human life in the auditorium, is about five minuets, the longest time recorded having been eight minutes and the shortest two, while most have ranged from four to six minutes. It is obvious that no fire-service, even if it succeeded in extinguishing the flames, could dissipate the smoke from a pile of burning scenery in five minutes, and, indeed, the effect of pouring water on the blazing mass would for a time be to increase the volume of smoke, and with it the danger to the audience. In the few instances where water has been thrown on a fire behind the scenes, the absence of good effect seems to indicate that this was the result; and the lesson of all recent fires in theatres is, as we have before remarked, that, no matter how modern, or carefully built, or thoroughly equipped a theatre may be, the only safety for those who go to it is to make themselves acquainted with the shortest path from their seats to the nearest door, and, on the first sign of smoke from behind the curtain, to run for their lives. If only those who can reach the door in one or two minutes are likely to be saved, as seems to be the rule, the obvious way of securing safety to as large a number of people as possible is to provide many doors; and, in our opinion, this should be the cardinal principle of theatre-planning, until the construction and furnishing of the stage is much altered from the present practice. The most elaborate system of pipes, sprinklers, iron curtains and stage ventilation, in a theatre with inadequate exits, at best makes the lives of the audience dependent upon the perfect working of a complicated mechanism; but if a hundred or more doors are provided, in all parts of the auditorium, through any one of which may be immediately reached the safety of a fireproof corridor opening to the outer air, with plenty of stone staircases leading to the ground, the spectators need not trouble themselves about conflagrations on the stage, however violent. There are theatres now in use from which the audience can, and generally does,

disperse in two minutes, and a test like this, reducing the time still further, if possible, is, under our present knowledge, the only reliable one of the fitness of a theatre for public use. To be safe, the corridors into which the doors from the auditorium open should be secure against danger from smoke, either by providing them with many windows, or, still better, by making them open colonnades; and a liberal number of fireproof staircases should connect them with the ground. Something may be done in a different way by planning the auditorium so as to communicate with adjoining rooms, and through these with the outside air, as is done in the Eden Theatre in Paris, and, in an imperfect way, with one or two theatres in New York, but the sufficiency of this resource is a matter to be carefully determined in each case.

A LARGE hotel is to be built at Los Angeles, California, and an invitation has been issued to architects to submit competitive designs. As the designs are to be sent in before September 20, and as a fair premium is offered, we suppose that a good many architects have by this time a certain interest in the matter, and will be glad to know how one, at least, of the aspirants for the honor of carrying out the work proposes to conduct his campaign. According to the Los Angeles *Herald*, a meeting of the subscribers to the fund for constructing the building was held the other day, at which the announcement was made that the entire sum, of one hundred thousand dollars, had been secured, so that the success of the first step in the enterprise was certain. Amid the congratulations which followed the communication of this good news, a proposal was brought in from a certain architect, volunteering to draw all plans of all sorts, and all working-drawings, and superintend the erection of the building, for a commission of three per cent, half to be paid in cash, and half in stock in the enterprise. The audience does not seem to have known just what to do with this interesting document, and referred it without discussion to the subscribers. When it comes up for action before these gentlemen, we advise them to refer it to the ash-barrel. If a public announcement of a man's feeble sense of honor, readiness to betray trust reposed in him, and low opinion of the value of his services, is calculated to ingratiate him with the most public-spirited business men in the beautiful "City of the Angels," they are very different from such persons in other places. Of course, there is no reason why the managers of such an enterprise should not get their professional advice at the lowest price suitable to the kind of advice they want; and there is still less reason why an architect should not take part of his pay in stock of any kind, if he wishes to invest his money so; but the Los Angeles people evidently think that the best professional service is the most profitable in the end, and are trying to get it; and an offer of cheap advice in place of good is likely to be about as attractive to them, independent of considerations of honesty, as would be to a lover, let us say, in search of a stylish tailor to make his wedding clothes, the solicitations of a vender of Chatham-Street misfits.

THE great English competition for the Admiralty and War Office, which took place about two years ago, has had a rather ignominious ending. The contest was won by Messrs. Leeming and Leeming, men then almost unknown in the profession, who sent in an agreeable Classical design, not strikingly original, and not altogether free from mistakes of architectural grammar. Certain architects criticised the work with unnecessary and ungenerous harshness, and it was even proposed to call upon the Government to withdraw the commission from the Messrs. Leeming, in the interest of art, just as in this country, years ago, a meeting of architects was held in New York to protest solemnly against the execution of the present design for the Albany State House in place of that of Messrs. Fuller and Laver. Fortunately for the Messrs. Leeming, and, as an example, for the profession in general, the English Government kept to its choice; but directions were given the architects to modify their design, which they did, with signal success. Here the matter rested, until some economical official suggested that money might be saved by altering over the existing buildings, instead of constructing new ones; and it seems to have been now fully decided to adopt this idea. Of course, the Government recognized the claim of the Messrs. Leeming to fair treatment in the matter, and the order has just been issued to pay them the sum of forty thousand dollars, as compensation for the abandonment of the scheme.

SOME one writes to ask us if we consider it a part of an architect's duty to roll pipes down planks, as in the method of testing them for uniform thickness, which we recently described. This is a question of great importance, as hardly any two architects agree as to the extent to which their duties of supervision should be carried. Practice in the profession varies widely, some architects taking great pains to examine materials as well as workmanship, while others think that they have done all that can be required of them if they visit their buildings two or three times a month; and many disclaim all interest in details of construction and entrust their superintendence to an "out-door man," engaged for the purpose. We should be very glad, in the interest of the profession, to have some expression of opinion on the subject, but will suggest, meanwhile, that it would be impracticable to lay down any rule as to the frequency of the visits which an architect should make to his work to fulfil his duty, or in regard to the course of investigation to be followed at his visits. Briefly, an architect is expected to know good material and construction from bad, and to take reasonable pains, in the interest of his clients, to discover and reject bad work. He is never regarded, by the courts of any civilized country, as responsible for the faithfulness of the builder, although unscrupulous clients often pretend to consider him so; but he is bound to be fairly quick in detecting errors, and reasonably well acquainted with the current modes of testing work of which he has suspicions. The art of observing quickly and carefully is not easily acquired. Draughtsmen in offices are often almost useless in superintending, for the reason that they become dazed by the complexity and variety of the operations carried on at the building, and stand vacantly about, while gross mistakes are being committed under their very eyes; and architects of considerable experience frequently find themselves overlooking important points. They are usually careful to rectify the omission later, but in case they fail to do so, the tendency of juries is to find them seriously at fault. In one noted instance, where an architect had ordered a rather difficult operation of raising an iron girder, the operation failed, and the girder fell upon a workman and killed him. The widow sued the architect for damages and he was compelled to pay five thousand dollars. There can be no question that if the accident had been due to a flaw in the iron, which could not have been discovered by ordinary expert observation, the architect would have been relieved of responsibility; and if his plan of raising was skilful and good, and he had taken pains to see it carried out, and it had failed through the unexpected carelessness of a workman, he could hardly have been condemned to pay damages; but the evidence showed that he was absent while the raising was going on, and the jury considered that this constituted a failure to do his duty in connection with so important a matter, and made him suffer accordingly. Although this was regarded at the time as rather harsh treatment of the architect, the case shows clearly the prevailing opinion that a man of science, to whom is entrusted the supreme direction of certain matters, ought to know at what moment his skill will be most needed, and take pains to be ready with it at those moments. In the same way he ought to know wherein defects in workmanship and material are most likely to occur, and to direct his attention opportunely to those points. So, to recur to the special instance which our correspondent mentions, while an architect could hardly be expected, under ordinary circumstances, to spend his time in rolling all the iron plumbing-pipes for a house down a pair of planks, it would, nevertheless, be prudent for him, if he found pipes delivered at the building of an unfamiliar make, or if he should have reason to doubt their quality, from the appearance of broken sections of pipe, or other circumstances, to test a number by rolling, or any other simple method. This would give him the general idea of their quality, which, in such a case, is all that he is expected to possess, and if he should direct the plumber's foreman to continue the test until all had been tried, and the bad ones rejected, he might be tolerably sure that a jury would not hold him responsible for the consequences of the breaking of a pipe later. Of course, he might not be held responsible if he did not try the pipes, and probably would not be if he could show that he had good reason, by previous knowledge of that make, for believing them to be good; but an architect who confessed that he knew nothing about the quality of certain important materials used under his supervision, and had not tried to ascertain it, would be certain to gain the unfavorable opinion of a jury, as well as of his clients.

BUILDING ACCIDENTS.[1]—IV.

ACCIDENTS DUE TO EXPLOSIONS OF STEAM BOILERS.

GETTYSBURG MONUMENT
DESIGNED BY J.G. BATTERSON

A RARE, but terribly serious cause of accidents to buildings, and one which is peculiarly frightful, in consequence of the horrors often attending it, as well as of the mystery which is very generally supposed to surround it, is the explosion of the steam boiler. There are in this country somewhere between 200,000 or 300,000 boilers probably, for it is difficult to obtain a statement that is very exact, and of these about one in every 10,000, at least, explodes annually. Careful supervision and the inspection of the boiler at regular intervals, as is done by the insurance companies, reduces this proportion greatly; but the risk accepted in the introduction of an ordinary steam boiler into a building is something to be considered, nevertheless.

A steam boiler is just as truly a magazine of energy as is a powder-magazine; and, in some sense, it is a much more dangerous magazine than the latter. It is absolutely certain that the powder can do no harm, and can give rise to no danger, so long as no fire reaches it — and that is a contingency which is very easily provided against; but a steam boiler is a magazine liable to apply its encaged energy, and that in enormous amount, to the destruction of the building, and of everybody near it, in consequence of the action of any one of many causes. The match is always lighted and hovering about it. The wonder is, not at all that so many explosions occur, or that they are so destructive of property and fatal to life, but rather that they so seldom take place, and that so little injury to property and so little loss of life follow such an accident. Were the amount of this stored energy realized, there would be much less surprise manifested at the destructive effect produced when it is set free by an explosion, and there would be fewer attempts to explain a so-called "mystery" by reference to unfamiliar and more mysterious causes. Were it realized that the energy stored in a steam boiler often represents that of many pounds of gunpowder, and that the great boilers formerly so common on our great river boats, even when carrying but comparatively low pressures, enclosed the equivalent of a very considerable fraction of a ton of powder, the destructive effect of a locomotive or of a Mississippi River explosion would be much less astonishing and mysterious.

The writer has taken occasion to have the amount of this stored energy calculated (See Figures 1 and 2) for a wide range of temperatures and pressures.[2] The results of calculation from well-established data show that the portion of stored energy which may act by conversion into mechanical energy from the primitive form, heat-energy, on the explosion of a boiler is such that, at fifty pounds pressure per square inch, it is sufficient, in the case of water at the temperature due the pressure, to raise its own weight a half-mile into the air; while the energy so derived from a mass of steam at the same temperature and under that pressure would raise its weight twelve miles high. At seventy-five pounds the figures become four-fifths and seventeen miles for water and steam respectively; and at one hundred pounds one mile and twenty miles. But while these figures show an enormous difference in the stored energy per pound weight of the two forms of fluid, and that steam stores vastly more than the water in contact with it and at the same temperature, pound for pound, the fact is that the water in all ordinary forms of boiler, as a mass, stores enormously greater amounts than the steam present with it. Calculating these quantities for some of the more familiar forms of steam boiler, we obtain the following table:[3]

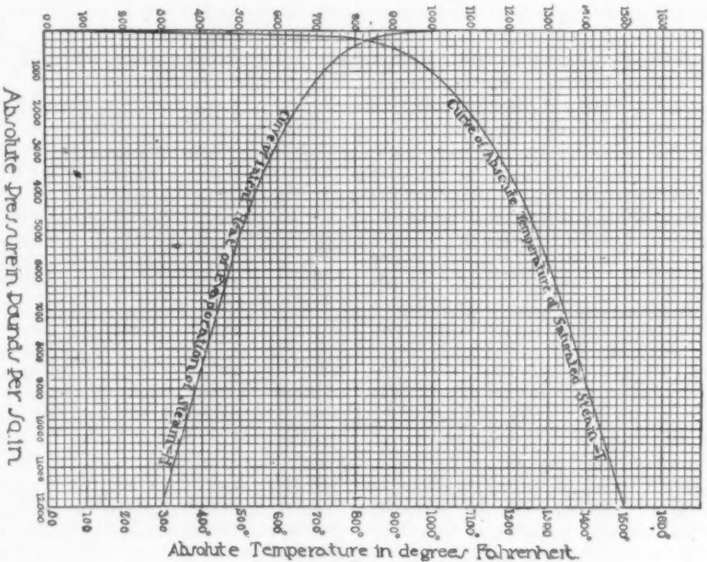

Absolute Pressure in Pounds per Sq. In.
Curve of Absolute Temperature of Saturated Steam
Absolute Temperature in degrees Fahrenheit

Fig 1

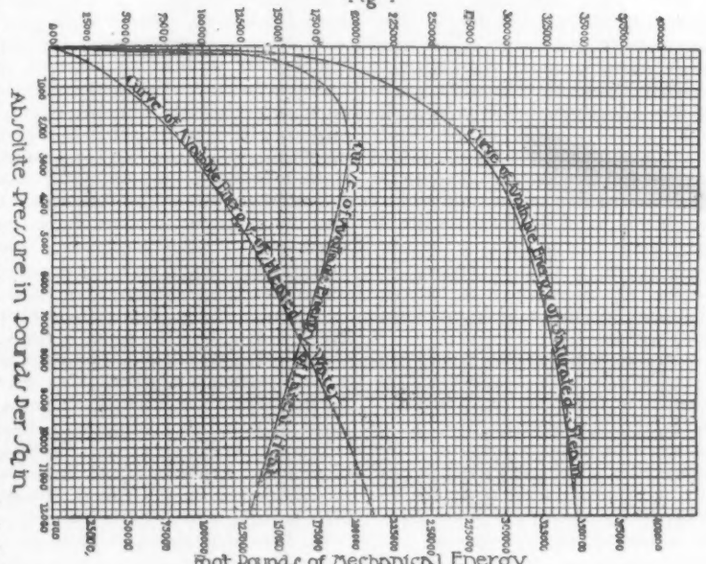


Fig 2.

Of the boilers here considered, Nos. 1, 2, 3, 4 and 13, 14, 15 are forms not infrequently used in the heating of buildings and in furnishing power to manufacturing establishments; the others are types in use mainly for marine purposes and in locomotive engines. Number 1 is the common "plain cylindrical boiler," one of the most familiar and simplest of known forms. The dimensions assumed are those taken by the writer, in some cases, in designing for such work, and may be considered as representing ordinary practice. This boiler, as is seen in the table, carries 100 pounds of steam, is rated at ten horse-power, though often rated higher, and stores 47,281,898 foot-pounds of available energy, of which less than fifteen per cent exists in the steam. This boiler, which is thirty inches in diameter, and as many feet in length, thus encloses sufficient power to raise itself over 18,000 feet, or nearly four miles high, were all this energy so applied. It is equivalent to the energy of impact at short range of the projectiles of a battery of siege artillery consisting of about fifty thirty-pound rifles. But this is less than one-half

[1] Continued from page 72, No. 607.

[2] "*On Steam Boilers as Magazines of Energy*;" Trans. Am. Soc. Mech. Eng'rs; 1884.

[3] "*Steam Boiler xplosions*;" R. H. Thurston, p. 20; New York: J. Wiley & Sons, 1887.

TOTAL STORED[1] AVAILABLE ENERGY OF STEAM BOILERS.

Type.	Area of G. S.	Area of H. S.	Pressure. lbs. per sq. inch.	Rated pow'r. H. P.	Weight of Boiler.	Weight of Water.	Weight of Steam.	Stored energy in (available) Water.	Stored energy in (available) Steam.	Stored energy in (available) Total.	Energy per lb. of Boiler.	Energy per lb. of Tot. w't.	Max. height of projection. Boiler.	Max. height of projection. Total.	Initial velocity. Boiler.	Initial velocity. Total.
	Sq. feet.				lbs.			Foot lbs.			Foot lbs.		Feet		Ft. per sec.	
1 Plain cylinder	15	120	100	10	2500	5764	11.325	46,605,200	676,698	47,281,898	18913	5714	18913	5714	1103	606
2 Cornish	36	730	30	60	16950	27471	31.45	57,570,750	709,310	58,260,060	3431	1314	3431	1314	471	290
3 Two-flue cylinder	20	400	150	35	6775	6840	37.04	80,572,050	2,377,357	82,949,407	12243	6076	12243	6076	888	625
4 Plain tubular	30	851.97	75	60	9500	8255	20.84	50,008,790	1,022,731	51,031,521	5372	2871	5372	2871	588	430
5 Locomotive	22	1070	125	525	19400	5260	21.67	52,561,075	1,483,896	54,044,971	2786	2189	2786	2189	423	375
6 "	30	1350	125	650	25000	6920	31.19	69,148,790	2,135,802	71,284,592	2851	2231	2851	2231	428	379
7 "	20	1200	125	600	20565	6450	25.65	64,452,270	1,766,447	66,218,717	3219	2448	3219	2448	455	397
8 "	15	875	125	425	14020	6330	19.02	64,253,160	1,302,431	65,555,591	4677	3213	4677	3213	549	455
9 Scotch marine	32	768	75	300	27045	11765	29.8	71,272,370	1,462,430	72,734,800	2689	1873	2689	1873	416	348
10 "	50.5	1119.5	75	350	37972	17730	47.2	107,408,340	2,316,392	109,724,732	2889	1968	2889	1968	431	356
11 Flue and return tubular	72.5	2324	30	200	56000	42845	69.81	90,531,490	1,570,517	92,101,987	1644	931	1644	931	325	245
12 " "	72	1755	30	180	56000	48570	73.07	102,628,410	1,643,854	104,272,264	1862	996	1862	996	346	253
13 Water tube	70	2806	100	250	34450	21325	35.31	172,455,270	2,108,110	174,563,380	5067	3073	5067	3073	571	445
14 "	100	3000	100	250	45000	28115	58.5	227,366,000	3,513,830	230,879,830	5130	3155	5130	3155	575	450
15 "	100	3000	100	250	54·00	13410	23.64	108,346,670	1,311,377	109,624,283	2030	1626	2030	1626	361	323

[1] This "stored" energy is less than that available in the non-condensing engine by the amount of the latent heat of external work $(p_1 - p_2)\,v$.

the destructive power encaged in some of the marine boilers now in use on transatlantic steamers, as is shown by No. 10 of our table, for example, or in many powerful land boilers, such as Nos. 14 and 15, or in the plain tubular, our most common form of heating boiler, when made of 100 horse-power, a not uncommon size. It is evidently not at all extraordinary that the explosion of such boilers, setting free as it does, these enormous and inconceivable quantities of energy should so often be followed by fearfully fatal and destructive consequences.

The Cornish boiler, No. 2 on the list, is one rarely seen in this country, and almost never applied to the purpose of heating buildings simply. It is seen in one of its most common sizes, and not at all a large boiler either, to store some twenty per cent more energy than the boiler first described. In this case, as in most of those here given, the boiler selected for computation is one either designed by, or operated at some time by the writer, and representing usual sizes and powers. No. 2 is a boiler of much greater weight, as compared with its stored energy than No. 1, and the height of projection corresponding to the stored energy is but about 3,400 feet. No. 3, a form of boiler now less frequently adopted than formerly, but one very usual still, where the feed-water is not pure, has about twice the stored energy of No. 1; but its height of projection is about two-thirds as great. No. 4, is the most commonly used of all forms of stationary boiler, both for heating and for power. That here taken is a very frequently adopted size; but it is not unusual to see them of 100 horse-power, or double this size. That here taken would be rated at from fifty to sixty horse-power, and stores sufficient energy to raise its own weight just about one mile, expending in the operation the equivalent of the energy of our fifty-gun battery, and a little more. The last three boilers on our list are so-called "water-tube" boilers of large size, boilers which are often known as "safety" boilers. It is at once seen that they do not necessarily enclose small amounts of destructive power. The claim made for them is simply that, whatever quantity of energy may be stored in them, its expenditure cannot be effected in a dangerous way, and that they are safe from explosion of a destructive kind. Their weights are seen to be comparatively great for their weights of enclosed fluids, and the height of projection comparatively small — 400 to 600 feet. The writer has never known of a seriously destructive explosion produced by any boiler of this class. Their immunity from danger of this sort is gradually bringing them into use, and while they are still vastly outnumbered by the older kinds of boiler, they are steadily coming in to occupy the field, and it seems very probable that ere long, they may assume a very prominent place in our statistics of boiler-power.

The locomotive boilers, Nos. 5 to 8, concentrate a very considerable amount of energy, and at very high pressures. They are heavy, however, in proportion to the quantity of fluid contained within them, and the height of projection given in the table thus happens to be no more than the average of other types of boiler. The violence with which they explode, and they explode not infrequently, measures, in some sense the destructiveness and danger to life which comes of high pressures. It is evident that, whatever amount of energy is stored in a boiler, it is incapable of doing harm unless under pressure, and that the danger increases as the pressure rises. These two quantities, amount of stored energy and pressure of steam carried, are two factors the product of which may be taken as measuring the dangerous character of the magazine. On the other hand, the danger arising from explosion is lessened when this stock of energy is so disposed that it cannot be all freed at once, as, for example, in the sectional boilers, where only a small fraction of the whole can be set free at any instant. Here the danger is the greater as pressures are higher, and less as the number of the sections is increased and their individual size diminishes. In some cases, also, as in the case of tubes, the rupture of the member is very certain to take place locally, and not by the explosion of the whole vessel, and thus the single part acts as a safety-valve, securing immunity from, instead of itself being a source of, danger.

The form of the boiler also determines what shall be the method of explosion, should it occur, and the manner in which the work of destruction will be accomplished. Thus, the upright tubular boiler usually gives way by forcing its lower tube-sheet down into the furnace, or by the "caving-in" of the furnace sides; in either case permitting the steam and water to issue at once, as a mass, at the bottom, and, by its reaction, throwing the boiler upward, traversing the air like a rocket and destroying whatever may be in the line of its motion. A cylindrical or tubular boiler is apt to break in two, and to project the two ends in opposite directions, tearing down walls and breaking up every structure lying in its own plane. At the same time, often, its shell breaks up, and the flying pieces deal wide-spread destruction. Of all these forms of boiler, those are most to be dreaded which, being capable of complete disruption, contain most water and explode at highest pressure. Thus the plain cylindrical boiler and the flue boilers are dangerous, as containing large bodies of water; the locomotive as working under high pressure, while the shell boilers, as a class, are dangerous in comparison with the sectional, because they are so constructed that they may set free the whole mass of contained energy instantaneously by explosion, the sectional only exploding a single small division of the structure at any one time.

The causes of steam-boiler explosions are commonly traceable after the accident has occurred, and are now known to be, certainly in the vast majority of cases, thoroughly well understood, perfectly simple in character. The writer has sometimes classified them under three heads; thus, (1) Ignorance; (2) carelessness; (3) absolute recklessness. In all instances investigated by the inspectors of the insurance companies, repairs indicate that either the boiler was too weak for its work, or that the steam-pressure was above that considered safe. Where the weakness is local the result is usually a "burst," as the engineer designates it, rather than a true "explosion," the steam and water being discharged without displacing the boiler or doing much, if any, damage to surrounding objects; but if the break is extensive, the result is apt to be an explosion in which the stored energy is all liberated on the instant to do its fearful work. Ignorance may have produced a design of boiler unfitted for its purpose; or it may have made too weak a structure, by error in form, or material, or in construction; or it may have led to mistakes in operation. Probably a very large proportion of observed explosions have been due to sheer carelessness or thoughtlessness on the part of the attendants, and many have been brought about by criminal recklessness.

Statistics show that from about one-third to one-half of all explosions reported are caused by deterioration or corrosion of the boiler or attachments, from one-fourth to one-third to defects in design or construction, a small percentage to "low-water," and the rest to other results of ignorance or carelessness.

Sediment and incrustation, producing overheating of the metal under the deposit, introduce danger very frequently; general corrosion, and especially the form of corrosion known as "grooving" or "furrowing," which takes place along any line of lap or other line of exceptional stiffness, and which thus localizes strains and rusting, produce a very large proportion of such "accidents," so-called. Bad workmanship and material lead to numerous defective and dangerous injuries of boilers. Overloaded and stuck safety-valves are a prolific cause of danger.

In earlier days, and even now among the few veteran engineers surviving, it has been the general and almost universal belief that a real explosion could only occur when, the water being allowed to fall below the level of the heating surfaces, fresh water is thrown in upon the overheated metal, and, being instantly evaporated, the steam so produced, adding its pressure to that already existing, causes explosion. But this is now known to be incorrect, and the great majority of explosions are due to the gradual increase of steam-pressure, or to the decrease of strength of the boiler by corrosion, until rupture takes place. That low-water does not necessarily lead to explosion has been proved by many instances of the contrary experience, some accidental, some purposely produced. As long ago as 1811, Captain Bunker, then in command of the first of the many steamboats built by the Stevens, father and son, for navigation of the inland waters of the Eastern States, found his boilers, on two occasions, quite empty, in consequence of the carelessness of the firemen, and filled them up, pumping the feed-water into the red-hot boiler. He observed no other or more startling phenomenon than a crackling sound as the water cooled the overheated iron. The writer has seen the same experiment made repeatedly, in the course of the work of a commission appointed to investigate this subject for the Government, and on several occasions with the same result, but in one instance with the effect of exploding the boiler. It is not a safe method of meeting that emergency. In such cases, the fire should be at once covered with wet ashes and then hauled, and the boiler cooled down and examined, before taking steps toward getting up steam again.

The overheating of the water, the entrance of the water into what is known as the spheroidal state, the decomposition of water into its constituent gases, the action of electricity, and other theories which are often proposed to account for the explosion of the steam boiler are probably all nearly equally improbable. There is, however, enough evidence of the possibility of heating the surfaces of the boiler, below the water-level, to a high temperature, and of consequent repulsion of the water from them, to cause many experienced engineers to attribute to this action those peculiarly violent explosions which are occasionally observed. It is supposed that the return of the water upon the sheet, as pressure rises, or as the metal cools to the temperature of restored contact, causes an exceedingly sudden production of such large quantities of steam as to give rise to an impact upon the sheet exposed to this action sufficient to break it into pieces. The experiments of Mr. Lawson, however, would seem to indicate that it is unnecessary to resort to so doubtful an hypothesis, and that the "geyser" theory of Clark and Colburn, which is now generally accepted by engineers, will account for all such cases. This theory, original with Mr. D. K. Clark, though first published by Zera Colburn, probably, and by him credited to Mr. Clark, considers that the opening of a rent in the boiler, at any point not far removed from the steam-space, leads to an outrush of steam, carrying with it masses of water which are projected with all the effect of "water-hammer" upon the edges of the opening, tearing it further, and thus progressively, but with enormous rapidity, breaking up the boiler and setting free all its stored energy to propel the detached pieces as so many projectiles in all directions, and with the velocity and destructive effect of so many cannon-shot. These ruptures once started, the tearing proceeds in all directions, and, often, without much reference to the strength of the iron, ripping strong as well as weak seams, and tearing good iron about as readily as that weakened by corrosion. A strong boiler is thus sometimes torn into many pieces, and its effect on surrounding objects is that of a battery of artillery loaded with grape or shrapnel. Such instances are, certainly, however, comparatively rare. The most terrible explosions, in violence and destructive effect, are usually those in which a strong boiler, well supplied with water, in consequence of a stuck safety-valve, or other defect of attachments, or by fault in management, resists a gradually increasing steam-pressure, until finally, reaching the limit of its strength, it gives way under abnormally high pressure, and, torn into pieces in the manner just described, sends its death-dealing projectiles in every direction, destroying the building in which it is placed, and, often, killing unsuspecting people hundreds of yards away.

We can hardly pick up a newspaper without finding an account of such a catastrophe, and frequently a list of killed and wounded that reminds one of the days of the civil war. Fortunately, thanks to the growing intelligence of those who have to do with steam-boilers, and especially to the work of the insurance companies and their inspectors, these accidents are continually becoming more rare and less fatal. They should become unknown; for it is well established that a well-designed, well-constructed and well-managed boiler does not explode.

To secure safety against explosions, it is now obvious, we must make sure of a good design, of good construction, and of intelligent and conscientious attendance. A good design is secured by the employment of intelligent, reliable and reputable engineers as designers. The majority of the boilers now put on the market are designed by such men, as every reputable firm employs an experienced and well-informed designer. Of all the designs now in general use, probably the plain tubular boiler is most common. It is capable of being made thoroughly strong, and safe against accident so long as it is properly cared for, is economical and compact. It should, however, always be kept under careful and skilful inspection, and the writer would always advise insurance with a strong and reputable company, even more scrupulously, if possible, than other property. Danger need never be incurred with this or, indeed, with any good form of boiler; but, should explosion take place, the results are certain to be serious. The sectional boilers, as already stated, are coming more generally into use, and, as the writer believes, more wisely, since they can not only be preserved as readily as the other forms against explosion; but should, through any cause, rupture take place, they cannot produce the disastrous effects so invariably observed when the "shell-boiler" explodes.

Good construction is insured by employing good makers, and, where the boiler is built to specifications furnished by the purchaser, by the employment of good inspectors during construction. When the boiler is purchased from the maker, already built, the buyer must trust to such inspection as he can make, or such as his inspector can make, of the finished structure. Makers of good reputation can be trusted to do their best; but even they sometimes make a slip, and the most careful examination of material and construction should always be made for the purchaser before the boiler is accepted. All attachments, and especially the feed apparatus and the safety-valves, should be selected by an expert and as carefully examined in place, and before the boiler is used, as the main structure itself. The material in the best boilers is a soft and ductile yet tenacious steel.

Proper location means the selection of the best position in which to place the boiler, not only with reference to its use, but and especially with regard to the safety of surrounding property and of lives, in case of accident. If the boiler is so set that its explosion is not likely to do harm, it may usually be said to be well located; but it should also be so placed that good feed-water is obtainable, and so that the steam may be conveniently taken to the point of application. The writer would prefer to set all shell-boilers in separate boiler-houses, and in such direction that explosion would be unlikely to impel their parts into the main building. Sectional boilers may be admitted into the building itself; but even then, the steam-drums and steam-pipes adjacent to the boiler, and especially if of considerable size, should be kept under constant inspection.

Safe operation and management can be only secured by the employment of men known by experience to be intelligent, conscientious, prompt in action, and reliable and ready in emergencies. Such men can only be had by paying good wages. They are always well worth all that the market demands for them, and the proprietor will usually also find that the sense of comfort and safety which comes with the entrance of a thoroughly good man into a boiler-room is worth vastly more than any difference of pay that might have been saved by the employment of one less experienced or less reliable. It may also be remarked that the cost of fuel is commonly so large, in proportion to other costs, that the good firemen will save, as a rule, many times the difference in wages; in fact, the cost of labor is here a matter of insignificant importance.

Any proprietor who has well-designed and well-built boilers, properly set in a safely located boiler-house, if well insured and kept inspected, and if managed by the right kind of attendants, may sleep in peace, assured that he is practically safe against this class of "*building accident.*" R. H. Thurston.

[To be continued.]

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF WILLIAM EDGAR, ESQ., NEWPORT, R. I. MESSRS. McKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

[Helio-chrome, issued only with the Imperial Edition.]

THE ROTCH TRAVELLING-SCHOLARSHIP DRAWINGS. — PLATES LVIII, LIX, LX.

[Issued only with the Imperial Edition.]

HOUSE FOR CHARLES A. KEBLER, ESQ. MESSRS. BUDDEMEYER, PLYMPTON & TROWBRIDGE, ARCHITECTS, CINCINNATI, O.

THIS house is built of pressed brick, laid Flemish bond, for first story and for chimneys, and of half-timber for second stories and gables; all constructive work and outside finish being done in Tennessee red cedar, with cypress for porches. Creosote-stained shingle roof. The first-story main rooms and hall are finished in hard wood, and the remainder of house in selected white pine. The cost was in the neighborhood of $16,000.

KENWOOD EVANGELICAL CHURCH, KENWOOD, ILL. MESSRS. W. W. BOYINGTON AND H. B. WHEELOCK, ASSOCIATED ARCHITECTS, CHICAGO, ILL.

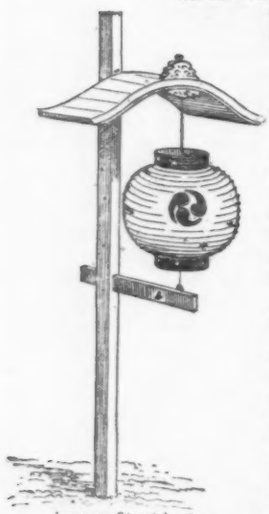
DESIGN FOR THE TOWN-HALL, GREAT BARRINGTON, MASS. MESSRS. STONE, CARPENTER & WILLSON, ARCHITECTS, PROVIDENCE, R. I.

CHURCH AT CUNAULT, FRANCE.

TECHNOLOGICAL SCHOOL, ATLANTA, GA. MESSRS. BRUCE & MORGAN, ARCHITECTS, ATLANTA, GA.

BUILDING MATERIALS.[1]—IV.

PRESERVATION OF STONE.



Japanese Street-Lantern.
From Morse's "*Japanese Homes.*"

THE question of the preservation of stone is one upon which much time and trouble have been expended without, however, leading to the attainment of any very satisfactory results, inasmuch as when good stone is employed no preserving process is required, and if, unfortunately, the best has to be made of inferior stone, it is only in exceptional cases that the cost and trouble involved in the adoption of any such process is likely to be incurred upon an extensive scale.

When the extent of the decay which had taken place in the stone of the Houses of Parliament was first fully realized, it created a good deal of excitement, and a Government Commission was appointed to inquire into the subject, who invited proposals for arresting its progress. In answer to this invitation, a great number of projects were brought forward for the attainment of the desired object, differing widely from each other in their character, many of them being the outcome of much thought and careful study of the question, whilst others were of a very crude nature and had no pretensions to any merit.

The principle upon which any process of this kind depends for success is evident, for since it is by means of water that the acid matters which act so injuriously upon stone obtain access to it, any process which succeeds in filling up the pores with some material of a permanent and unalterable character must be likely to act as an effective preservative. This, at first sight, would seem very easy to accomplish. There is no difficulty in closing the pores of a piece of soft chalk or Caen stone, so as to harden the surface and make it non-absorbent of water. When, however, stone is once in position, and we have it in the form of a vertical wall, the task is a more difficult one. Under such circumstances it is impossible to make any solution penetrate to a sufficient depth by a single application; it requires to be frequently repeated, beginning with very weak solutions, before the stone can be made to absorb it in sufficient quantity, or to any considerable depth; whilst if it be a mere surface-covering, it is likely to be of little more use than ordinary painting, which requires to be renewed every four or five years.

Since we know that of all the constituents of stone there is nothing more permanent than silica, and that the combinations into which this substance enters are numerous and varied, and, moreover, that silicates are capable of being readily manufactured by easy and inexpensive processes, it was natural that some solution of silica should have been amongst the first to suggest itself to the chemist as likely to prove eminently successful as an application for the hardening of stone. Accordingly we find that, as far back as the year 1826, Professor Fuchs, of Munich, proposed an alkaline solution of silica, under the name of soluble glass, for the solidification of stone. Professor Kuhlmann, of Lille, subsequently read a series of papers before the French Academy of Sciences, on the application of water-glass (silicate of potash) to the hardening of stone. The great drawback to the use of these alkaline silicates is the efflorescence to which they necessarily give rise. In order to avoid this difficulty, other methods were proposed some years later to the Commission appointed to inquire into the condition of the stone of the Houses of Parliament. Amongst these was a solution of baryta, followed by a solution of superphosphate of lime, which produced a precipitate within the pores of the stone of insoluble phosphate of lime and phosphate of baryta; another was silico-fluoric acid in conjunction with baryta, both of which processes were attended with a certain amount of success.

Limestones may also be rendered non-porous by the application of oxalate of alumina, which produces an insoluble precipitate of oxalate of lime and alumina. Any of these processes fill up the pores of the stone with material of a permanent character without giving rise to the production of soluble salts which require to be washed out. The use of organic substances, such as linseed oil, afford considerable protection for a time, but organic matter of this description is liable to be changed by combining with the oxygen of the air. In the case of ordinary painting, it is the oxidation of the oil of the paint that causes the paint to scale off in the course of a few years, the oil being converted into a brittle resinous substance. The rapidity with which gutta-percha, when exposed in thin strips to the influence of light and air, loses elasticity and is converted into a brittle material, affords a good illustration of this oxidation of organic matter. Of materials not belonging to the inorganic or mineral class, one of the least subject to any change is paraffin, and on this account the use of paraffin applied in various ways, sometimes in solution and sometimes in a melted state, has been at various times suggested as a means of preserving stone by preventing the penetration of moisture. We have a striking example of the effect of climate upon stone in the Egyptian obelisks which, after remaining unaltered for thousands of years in the dry climate of Egypt, are no sooner removed to such an atmosphere as that of London, than they begin to show signs of disintegration and decay, as is more or less the case with all the three obelisks that have been brought away from Egypt, one erected in New York, another in Paris, and a third on the Thames Embankment. Their condition is no doubt, to a considerable extent, due to injuries received whilst they laid neglected on the sands of Alexandria, and partly to such as were unavoidable in transporting them to the several positions they now occupy. The decay that has taken place in the New York obelisk appears to have been very much greater than is the case with the one erected in London. In a paper read before the New York Academy of Sciences, it is stated that exfoliation had taken place to a serious extent, pieces of considerable size becoming detached from the mass. Attempts at preserving the stone from further decay have been made both at London and New York. The method adopted in New York by the advice of Dr. Doremus, consisted in the use of paraffin, which was applied in a melted condition (mixed with a little creosote) to the stone, previously warmed by means of a small portable furnace. In this manner the paraffin could be made to penetrate to a depth of from a quarter to half an inch.

A very popular building stone in New York is that known as "brownstone," which, from its liability to decay, necessitates the use of some preservative process, and the paraffin treatment has been employed upon various buildings in New York with results that have been regarded as successful. With respect to the obelisk, however, the last reports I have seen are not in favor of this mode of treatment. Any process which involves the heating of the surface of the stone, must always be attended with considerable risk of failure.

The obelisk on the Thames Embankment has also been subjected to a preservative process, but of a different kind. Upon its showing indications of being acted upon by exposure to the atmosphere of London, the Board of Works, in 1879, under the joint advice of their engineer and consulting chemist, entrusted the task of coating it with a preservative solution, consisting essentially of a solution of gum resins in petroleum spirit, to the Indestructible Paint Company. The solution was very carefully applied after cleaning the obelisk thoroughly, beginning with a very weak solution, and repeating the application as long as the stone could be made to absorb it. So far, the application appears to have been of service, but a period of eight years is too short a time to allow of any decided opinion being formed as to the durability of such a protective coating.

[1] A lecture by W. Y. Dent, F.C.S., F.I.C., read before the Society of Arts, and published in the *Journal* of the Society. Continued from page 126, No. 611.

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Ritterspe Printing Co. Boston

American Architect and Building News, Sept. 17 1887. No. 612

Kenwood Evangelical Church,

Kenwood Ills.

W. W. Boyington } Associate
H. B. Wheelock } Architects.
Chicago.

Robert B. Hotchkin, del.

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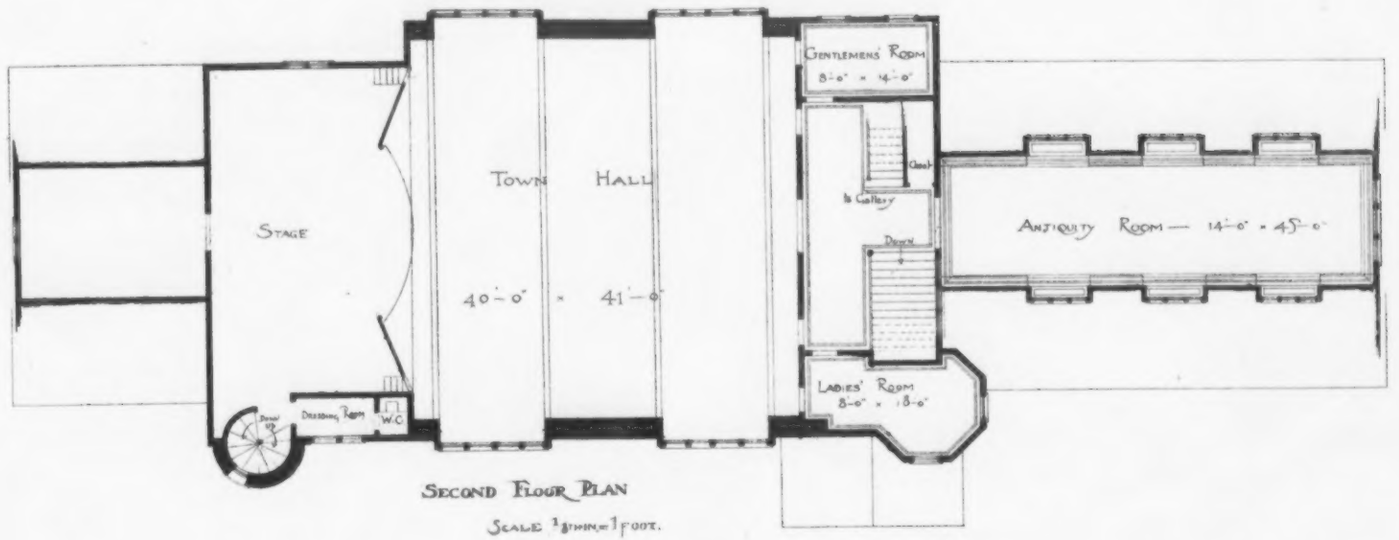
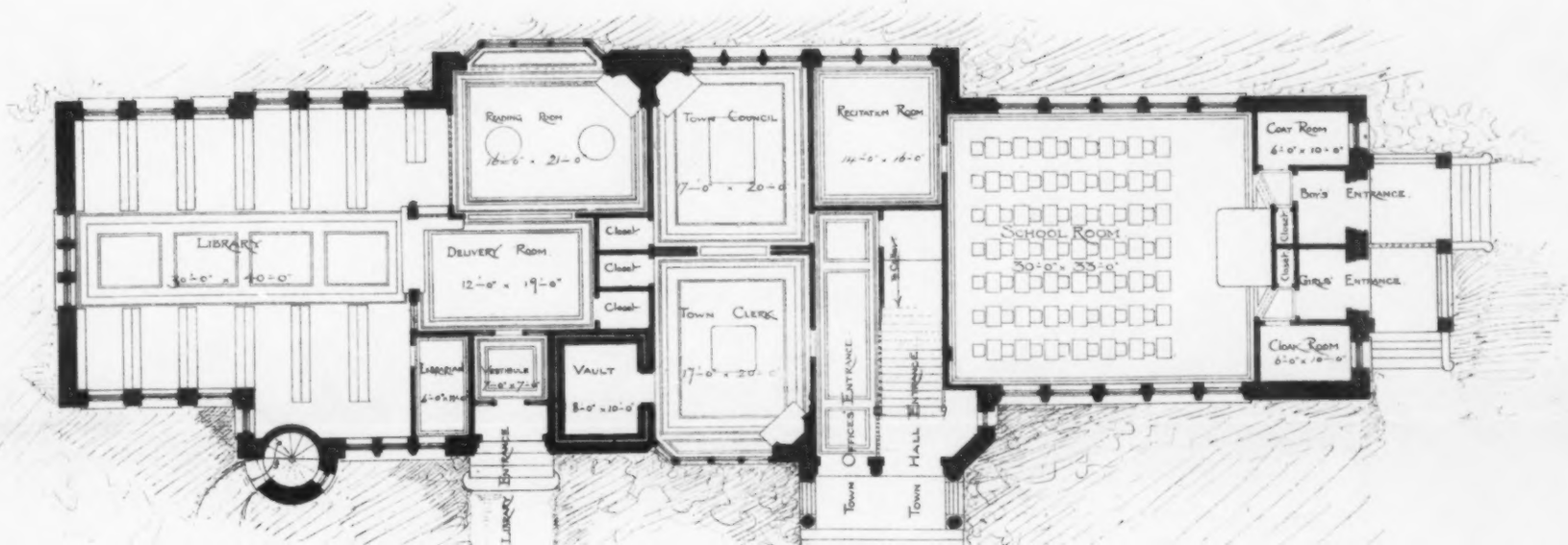
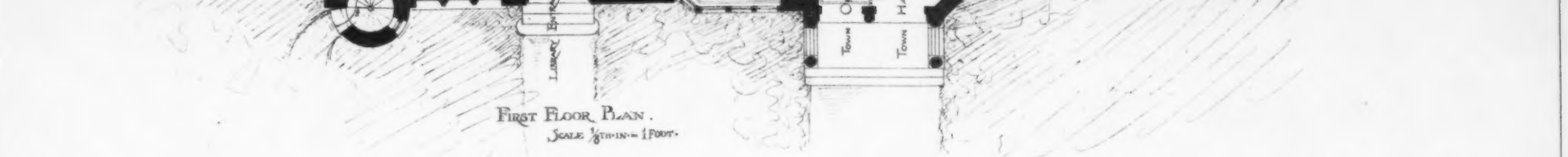


SECOND FLOOR PLAN

SCALE ⅛ INCH = 1 FOOT.





First Floor Plan.

Scale 1/8th-in. = 1 Foot.

Sketch from South-West of Town-Hall for the Town of BARRINGTON, R.I.

Heliotype Printing Co. Boston

Heliotype Printing Co. Boston.

Church at Cunault, France

American Architect and Building News, Sept. 17, 1887. No. 612

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Technological School
Atlanta Ga.

Bruce and Morgan Architects

Heliotype Printing Co. Boston.

As regards the palace at Westminster, the decay, after all, cannot be said to have affected its stability as a building; it has been chiefly confined to places underneath string-courses, or ledges, which are kept constantly damp by the rain collecting upon, and percolating through, the stone above. Some of the finials have also been broken by the rusting of the iron rods that supported them. What is now being done in the way of preservation, is to coat such projecting surfaces with mastic or cement, so as to allow the rain to flow off freely, without allowing it any opportunity for penetrating the stone, and to remove decayed and imperfect stone, replacing it with sound material.

If care be taken in the selection of stone, it is only under special and exceptional circumstances that it will be considered desirable to resort to methods of preservation, which must necessarily be expensive, and can only be regarded as the best cure for defects that admit of no other remedy.

ARTIFICIAL STONE.

The numerous attempts that have been made at different times to produce an artificial material that should be capable of being used in the place of natural stone, having resulted in the very general use of concrete, or materials in which Portland cement is the binding material. The closest imitation of natural stone is perhaps that manufactured by Mr. Ransome, who took out his first patent forty-two years ago. It was not, however, until 1856 that any successful result attended his experiments, when he found that by the use of calcium chloride, in conjunction with silicate of soda, an efficient binding material could be obtained that, when mixed with sand, would solidify into a hard mass. By the action of calcium chloride upon silicate of soda, an insoluble silicate of lime is formed, leaving a soluble sodium chloride, or common salt, which had to be removed by washing, an operation which, although apparently very simple, proved to be extremely difficult in practice. In spite of the greatest care it was found impossible to wash out the last traces of soluble salt from massive blocks, and consequently the stone was liable to be disfigured by efflorescence. This stone was subsequently prepared by an improved process, but it cannot be produced to compete with the lower price at which substitutes for stone can be made by the aid of Portland cement.

Silicate of soda is readily obtained by boiling flints in a solution of caustic soda under a pressure of sixty pounds on the square inch; or it may be obtained by simply boiling certain siliceous deposits found in various parts of the world in an open vessel. In certain strata of the lower chalk formation in the counties of Surrey and Hampshire, there are beds which contain silica in this readily soluble condition, some of which, in the neighborhood of Farnham, will yield as much as from fifty to seventy per cent of silica by simply boiling with caustic soda.

The Victoria Stone Company has for the last sixteen years been producing a very excellent material as artificial stone, especially adapted for sinks, flagstones, and landings, which is capable of competing successfully with the best Yorkshire flagging. It may be regarded as a fine description of concrete, being produced by binding together granite siftings by means of Portland cement. Their principal works are situated near the Groby granite quarries, not far from Leicester, and it is the siftings of the broken granite that are thus utilized. These siftings, after being washed, are mixed with Portland cement in the proportion of three parts of the former to one of the latter, sufficient water being added to cause the cement to set. The surface of the blocks is further hardened by being placed in tanks containing a solution of silicate of soda.

There are other kinds of artificial pavement now manufactured, in the preparation of which broken granite and blast-furnace slag are employed, but they all depend principally upon Portland cement as the binding material.

TERRA-COTTA.

During the last twenty years much attention has been paid to the manufacture of a material to be used as a substitute for stone, which, so far from being of modern origin, is associated with the very earliest history of our race. It is known by the name of terra-cotta. As regards durability, burned clay is capable of resisting the effects of time to as great an extent as any other material used for constructive purposes, of which we have abundant evidence in the specimens of Assyrian and Egyptian antiquities in the British Museum. The use of terra-cotta affords facilities for the production of elaborate designs, the clay model itself being converted by baking into a material more durable than stone. It is much lighter than stone, as compared with the crushing force it will sustain; and by the use of different clays a variety of colors may be obtained. Against these advantages must be considered the difficulties presented in the liability of the clay to shrinkage, both in drying and firing, which in spite of the greatest care and experience, not unfrequently produces distortion from unequal contraction. To the improved manufacture of this material, a great impetus was given by its being adopted to such a large extent for the Albert Hall and other buildings at South Kensington, the perfection to which it has now attained being, to a great extent, due to the energy and skill displayed by Messrs. Doulton & Co., as well as by other manufacturers. Success depends upon the use of a due proportion of the several materials employed, on the attention paid to the grinding and mixing, and to the care bestowed during the operations of drying and firing.

FIRE-BRICKS.

The plastic clays consist of silica and alumina, chemically combined with water. They are hydrated silicates of alumina, their plasticity depending upon the water that enters into their composition. The water, with which the clay is mechanically combined, can be expelled at a temperature a little above that of boiling, without detriment to its plasticity, but the whole of the water it contains cannot be driven off without raising the temperature to dull redness. Silica, alumnia, and lime are all separately very infusible substances, and are capable of resisting exposure to very high temperatures without softening. It is on account of its extreme infusibility that lime is found to be the most suitable material for the cylinders upon which the oxyhydrogen flame is made to impinge to produce a brilliant light, the intensity of the light being due to the extremely high temperature to which the lime is raised. Lime, however, from its want of cohesion, could never be brought into general use for such purposes as fire-clay is employed, and this is also the case as regards silica, which requires the addition of some substance of a basic character with which it will unite, and so cause the particles to bind together.

The nearest approach to the use of silica alone as a fire-brick is in the well-known Welsh brick, made from the Dinas rock in the Vale of Neath. This material, before it was made into fire-bricks, had long been used for repairing the furnaces at the copper works of South Wales, for which purpose its peculiar property of expanding when subjected to the influence of high temperature, instead of contracting (as is the case with ordinary fire-clay,) renders it particularly suitable, the cementation of the bricks being facilitated by the increase of temperature. In order to make bricks of this Dinas rock (which occurs in various conditions, from that of a firm rock to that of disintegrated sand,) it is necessary to mix with it about one per cent of lime. These Dinas bricks will stand very high temperatures, but they are more friable than ordinary fire-bricks, and will not resist to the same extent the action of basic substances, such as furnace slags containing much oxide of iron. The bricks are porous, readily absorbing moisture, hence it is necessary that furnaces built of these bricks should be gradually heated, the bricks being liable to crack if sufficient time is not allowed for driving off the moisture.

The composition of the clay used for fire-bricks is a question of considerable importance, inasmuch as its quality depends greatly upon its chemical constituents, although its power of resisting fusion, when exposed to intense heat, is effected by its mechanical condition. The same materials, when mixed together in the form of a coarse powder, will require a higher temperature to fuse them than would be the case if they were reduced to a fine state of division. For the manufacture of fire-bricks the raw clay is ground between rollers or under edge stones, or reduced to powder by means of a Carr's disintegrator, which consists of large cylinders constructed of wrought-iron bars revolving rapidly in opposite directions. The clay is then kneaded with water, old bricks or other fired ware reduced to a coarse powder, technically known as "grogg," being mixed with the raw clay. This admixture of previously burnt clay renders the bricks less liable to shrink, and enables them to bear a much higher temperature without fusion than would be the case if only new clay were employed. The qualities required in fire-bricks are —

1. That they should bear exposure to intense heat for a long period without fusion.
2. That they should be capable of being subjected to sudden changes of temperature without injury.
3. That they should be able to resist the action of melted copper or iron slags.

It is not to be expected that any one description of brick should exhibit all these qualities to the fullest extent, and, it is therefore essential that, in selecting the kind of fire-brick to be used, due regard should be paid to the particular purpose for which it is required.

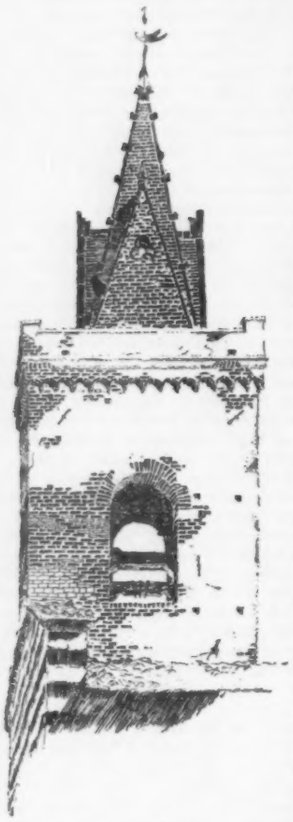
A fire-brick like the Dinas, containing ninety-eight per cent of silica, will bear exposure to a higher temperature than a Stourbridge, but it will run down sooner than the Stourbridge when in contact with melted iron slag.

Gannister is the name given to a fine grit which occurs under certain coal beds in Yorkshire, Derbyshire, and South Wales, which is especially adapted for lining cupola furnaces; the peculiar black gannister from the neighborhood of Sheffield is in great request for this purpose, as, owing to the large quantity of silica it contains (from eighty to ninety per cent), it will stand high temperatures without shrinking. The Lee Moor bricks are manufactured at Plympton, in Devonshire, from the coarser portions of decomposed granite, separated from the china clay during the process of washing. These bricks contain a large proportion of silica, and are very infusible, their power of supporting exposure to very high temperatures being increased by the coarseness of the particles of disintegrated granite, of which they are composed.

Fire-bricks are also made of silicious clays from the granitic deposits in other parts of Devonshire. The material employed for such bricks, as well as for the Dinas, differs materially in its character from what is ordinarily understood by the term fire-clay, as used in the manufacture of such well-known bricks as the Stourbridge, Newcastle, or Glenboig; the quality of which, as regards their chemical composition, depends upon the relative proportions of silica and alumnia, and their freedom from iron oxide and alkaline salts, the presence of which tend to render the clay more fusible.

[To be continued.]

FURNITURE EXHIBITION, ANTWERP.



A Campanile at Pistoja.
From a drawing by Edwin Geo. Hardy

On a portion of the site of the Antwerp Exhibition of 1885, a permanent *Palais de l'Industrie* has been erected, to serve for holding special exhibitions which are now so much appreciated in various countries, and which have the advantage of bringing into close proximity cognate objects that can thus be viewed by the specialist without having to wade through a vast number of possibly uninteresting exhibits. This year the exhibition is international, and embraces Furniture, Costume, Landscape-Gardening and Horticultural Implements. In connection with the third of these sections a horticultural exhibition has lately been held by the Cercle Floral, of Antwerp, Mr. Veitch, of London, Eng., being President General of the Jury. Instead of being merely exhibited on separate stands in a formal manner, the beautiful palms, fern-trees and other exotic plants were tastefully laid out in *parterres* by M. Bourland, the manager, forming a *coup d'œil*, which added greatly to the attractiveness of the exhibition generally. Moreover, the show-cases themselves are in many instances works of art, several of them being in carved oak. A very pleasing effect is given to some French and American plate — a great deal of it frosted silver — by laying red cloth on the glass top of the show-case, thus throwing a red lustre on the objects. At one end of the building, behind a bust of Rubens — whom Antwerp claims as one of her most illustrious citizens — is hung a velvet pile tapestry, made specially by Jardine & Norway, of London, for Pope Pio Nono, but not completed within the specified time. It was designed by the Swedish painter, Thorwaldsen, and represents Christ in the middle of the Twelve Apostles, each bearing his conventional symbol. The composition is not intended for near effect, but from the opposite side of the building the figures stand out in bold relief from the maroon ground. So large is the work that the value of the wool alone is $1,200, while the price asked is $5,000. Haim Vidal, of Constantinople, exhibits various Oriental carpets, including those of Smyrna, where he has a factory.

Some exhibitors show carved oak chairs, in imitation of the antique, having embossed-leather backs and seats. There are several *cheminées*, or mantel-pieces, worthy of notice, including one in white marble of Belgian design — that is to say, with returns at the sides of the chimney-breast — and having cariatydes at the corners. The fender is made of plaster-of-Paris, and the fire-irons are whitened to match. A fire-grate, in which the advantages of the close stove and the open grate are combined, has a canopy in antique *repoussé* brass after the style of the *dinanderies* (salvers), so called from their having been originally made at Dinant, the city at the confluence of the Sambre and Meuse. There are several artistic *buffets* and *étagères* of carved oak in Flemish Renaissance style, and garnished with stained-glass panels, old china, both real and imitation, and encaustic tiles.

Oak furniture in imitation of the antique is made at Brussels, Antwerp and Mechlin, at which last-named place it is now the staple manufacture, having quite superseded that of lace, so renowned of yore. The Mechlin or Malines oak furniture is noted for boldness of design if somewhat coarse in execution, and that of Brussels is distinguished by excellence of workmanship and fineness of finish, while that of Antwerp may be said to come between the two. However, Teugels-Schippers, of Mechlin, has sent an old man, "a lean and slipper'd pantaloon," carved in oak with great skill. An oak dining-table, rectangular, with corners taken off square, has the top inlaid with oak stained to different shades, which produces a good effect. De Visser shows an elegant suite of bed-room furniture in birch imitating bamboo, which is very much in vogue in Belgium just now. Among the lots in the *tombola* or lottery that has been organized in connection with the exhibition is an easy chair composed of silver-mounted lengths of real bamboo, comfortable as well as ornamental. Simon & Vivenot, of Ligny-en-Barrois, France, send a portable table and four seats called "La Lorraine," which pack into a space of 85 cm. by 18 cm. by 20 cm., or 33″ x 8″ x 7″. Expanded the table measures 85 cm. by 73 cm. by 60 cm., or 33″ x 29″ x 24″.

Janssens, of Antwerp, has mounted a trophy with various encaustic tiles, including some of humorous design. And Gommey, of Mechlin, has sent two views of old Antwerp executed in encaustic tiles copied from ancient models. One view of the city from the Scheldt bears the inscription "*Antverpia, urbs Belgica ad Scaldin sita, Anno MDLV*," and the other, of the Grand Place, "*Vetus curia Antverpiæ*, 1564." The artistic Linthorpe ware and Torquay terra-cotta for hand-painting are represented at this small but tastefully-arranged exhibition, where, also, the Oswego Company's indestructible-fibre pails, light, strong and acid-proof, also find a place. Novelli, of Florence, exhibits specimens of the beautiful inlaid marble work of that city, and Frilli, the Florentine sculptor, shows white marble statuary, including a copy of the "*Veiled Lady*," which was so much admired at the Liverpool Exhibition of last year, and was bought by Edward Legger, of *The Era*. Van Boeckel, a worthy disciple of Quentin Matsys, contributes a foliated well-top in forged iron, calling to mind that of the great painter and blacksmith near the west front of Antwerp Cathedral. A worthy pendant is the *jardinière* in cast-iron open work sent by Van Offelen, of Antwerp, and Mijnheer Dierckx, of the same city, contributes a large and handsome vase in copper, the natural color, relieved by black-iron pedestal and scroll-work, somewhat after the style of those shown for the first time at the Birmingham Exhibition of last year.

Frank Davis, of Brussels, has erected a shed to show the advantages of the transparent wire-wove roofing substance, so largely used in the railway approach to the American Exhibition now being held in London. It is a flexible, gelatinous substance, strengthened by wire-gauze, light, translucent, elastic and admirably adapted for temporary structures and rendering sky-lights unnecessary. When the somewhat high price is reduced by greater economy in manufacture, and sufficient time has elapsed to prove the durability of this new roofing substance, there is little doubt but that it will be largely used. J. Gilson sends a working model of his lift, designed on the principle of the "lazy tongs," and worked by hand or power acting through winch gear.

On September 18th will be celebrated the centenary of Joost Van den Vondel, the Flemish poet, when prizes will be awarded for the best banners of the many societies of all kinds, successors of the ancient Guilds of Belgium. On the 25th of the same month, a *fête*, organized by the Belgian press, will be given for founding a *caisse de prévoyance* or benefit fund, and on October 2d, will be distributed the prizes awarded in connection with the *Exposition d'Ameublement*.

J. W. P.

THE FATE OF GREAT ASIATIC ARCHITECTS.

Mr. W. A. Clouston writes as follows in a recent issue of *Notes and Queries:* It is well known that Oriental potentates in former times were wont to bestow gifts of enormous value on poets and artists whose works they admired. We often read of a rájá, sultán, or khalíf rewarding a poet for a few laudatory verses by causing his mouth to be filled with pearls and precious stones; and instances are recorded of learned men being kept prisoners by Asiatic princes in order that they should not adorn the court of any rival monarch. Many Eastern stories turn on the quest of some extraordinary object which should render its royal possessor immeasurably superior to all the kings of the earth, past and present. To the passion for the display of wealth and power are to be ascribed the numerous magnificent palaces, temples, mosques, and mausoleums erected by princes of India and Persia: but while the gifted architects were generally remunerated with riches "beyond the dreams of avarice," it would appear they sometimes fell victims to the jealousy of their royal patrons. Such was the fate of Semnar, who constructed for Nu'mán, an Arab prince, the palace of Khavarnak, if we may credit the following anecdote from the "*Heft Menzer*," or "*Seven Faces*," of the Persian Abdallah Hatifi (*ob.* A.H. 927, A.D. 1520): — "When Semnar had finished this costly edifice, so much beyond the expectation of his employer, his merits were duly appreciated and his labors crowned with the highest applause. The reward of the architect's successful skill was not confined to praise alone, for Nu'mán showered on him gifts far beyond his fondest expectations: camel-loads of pure gold, pearls, and precious stones, ambergris and musk; and all in such abundant quantities as would ensure him ease and comfort during the rest of his life. Nu'mán was well aware that he who desires to possess magnificent works of art must open wide the portals of liberality; a cook who is sparing of condiments and fuel cannot expect that the feast

will please the guests. When the architect received this unlooked-for bounty he apologized and said 'O king, had I anticipated such noble generosity, I should have bestowed greater pains on my work, and made it vastly more worthy of your majesty's greatness and munificence.' 'What!' exclaimed Nu'mán in astonishment, 'do you conceive it possible, with a larger supply of materials and a promise of higher remuneration, you could erect aught more splendid than this palace?' 'Yes, sire,' replied Semnar; 'if your majesty wished for something absolutely incomparable, I could erect such a palace that Khavarnak should appear insignificant in comparison. In this palace I have made use of but three colors; in that a hundred different tints should unite their beauty; that which is here common stone should be in the other the finest ruby; this palace has but one dome, but the other, like the ethereal world, should glory in seven.' On hearing this the king was inflamed with wrath and his countenance caused a conflagration in the stores of royal beneficence. Truly a king is a fire, from the blaze of which he only is secure who looks at it from afar. . . . Nu'mán's pride suggested that should Semnar be allowed to live some rival in power and wealth might by his means be enabled to erect a palace more splendid than Khavarnak, and he therefore commanded his attendants to put him to death. Thus did they dig up this cypress from the garden of life; his eyes were covered and he was thrown from the summit of the palace. Behold the waywardness of destiny, which made the proud monument of his skill and labor the unconscious instrument of his destruction!"

Still more horrible was the fate of the constructors of Trimal Naig's choultry at Madura, whom the Indian tyrant ordered to be thrown into a dungeon, the entrance of which was then built up, and they were thus buried alive, to prevent them from possibly erecting an edifice elsewhere which should eclipse that monument of his grandeur; and Trimal caused the two unfortunate architects to be sculptured on the walls incarcerated in a cell, which one should suppose calculated to repress the noble zeal of all future artists!

The skilful armorer who forged the sword Dham which came into the possession of the celebrated Bedouin poet-hero Antar by a lucky accident fared no better at the hands of his employer, an Arab chief. That famous blade was made from a thunderbolt that had slain one of the chief's camels, and when the smith delivered it, with natural pride, to his patron, he observed: "This sword is sharp, O chief of the tribe of Ghaylib — sharp indeed: but where is the smiter for this sword?" Quoth the chieftain: "As for the smiter — I am he," and instantly struck off the smith's head, so that there should never be another sword Dahm!

I think these stories have parallels in European legends and traditions. I have some recollection of having read, many years since, of an artist who constructed for a German prince a wonderful clock, and had his eyes put out by order of his royal employer, lest he should carry his art elsewhere and excel this complicated piece of mechanism; the artist some time after requested to be led to the clock that he might adjust something, and smiting it with a small hammer destroyed the joint production of his brain and hands.

PLATE-GLASS MAKING.[1]

FOLLOWING the order given in our table, we shall next take up the manufacture of plate-glass, and for this purpose I shall again ask your presence in Pittsburgh. This time, however, our visit will be to Creighton, some twenty miles north of the city, and near to the well-known natural-gas district of Tarentum. There are in this country four large establishments where plate-glass is manufactured. The Creighton plant has the reputation, however, of enjoying the most favorable economic conditions, and it would certainly be difficult to find in this or any other country one more completely equipped. The glass itself has the same constitution as the sheet and crown glass. It is simply a double silicate of lime and soda. The melting is carried out in large open pots, the furnaces differing in their construction from those already described only in their greater size and the substitution of doors made of fire-clay tiles set in cast-iron frames for the usual gathering holes. When the fusion has been completed, the door opposite the pot is opened, and a two-pronged fork, mounted on wheels, is inserted into the furnace. The distance between the prongs is sufficient to permit them to pass into depressions made in each side of the melting-pot, and thus secure it in a firm grasp. By this method the pot of molten glass is removed from the furnace, and is carried on a low truck to the casting-table. At Creighton, the casting-house, containing furnaces, tables and annealing-ovens, is 650′ x 160′, about four times as large as the famous *halle* of St. Gobain, in France, and nearly double the size of the British Works at Ravenhead. There are two casting-tables at Creighton, seven inches thick, nineteen feet long, and fourteen feet wide. Each is provided with an iron roller, thirty inches in diameter and fifteen feet long. Strips of iron on each side of the table afford a bearing for the rollers, and determine the thickness of the plate of glass. The tables are mounted on wheels and run on a track which reaches every furnace and annealing-oven. The table having been brought as near as possible to the melting-furnace, the pot of molten glass is lifted by means of a crane, and its contents quickly poured on the table. The heavy iron roller is then passed from end to end, spreading the glass into a layer of uniform thickness.

As rapidly as possible, the door of the annealing-oven is opened, and the plate of glass is introduced. The door is then closed, and the glass left to anneal. All of these operations are performed in little more time than it takes to describe them, as it is desirable to get the glass into the annealing-oven as hot as can be. A large number of ovens are required for annealing purposes, as the glass must remain several days to cool. When the glass is taken out, its surface is found to be decidedly rough and uneven. A small quantity is used in this condition for skylights and other purposes where strength is required without transparency. It is known in the market as rough plate. The greater part of the glass is ground, smoothed and polished before it leaves the works. The grinding is accomplished by means of rotary grinding machines, the abrading material being common river-sand dredged from the Alleghany. Three million bushels are required annually for this purpose. The plates are firmly fixed on large rotary tables or platforms by means of plaster-of-Paris. Rotating discs are so arranged that they cover the entire surface of the glass at each rotation of the platform. Small jets of water keep the grinding-sand always wet. These operations remove the rough exterior. The smoothing is accomplished by emery, finer and finer grades being used as the process proceeds. The final polishing is done by means of rouge (carefully-calcined sulphate of iron).

The monthly product of the Creighton plant is about 100,000 square feet of glass. The fuel throughout the entire works is natural-gas, which here displaces about 3,000 bushels of coal daily. It is used in melting-furnaces and annealing-ovens, as well as in supplying the steam for engines of about 1,500 aggregate horse-power. These figures will give you some idea of the magnitude of the operations connected with a large factory, and will perhaps dispel the notion, if such exist, that we are largely dependent upon France for our supply of plate-glass. The output of this factory, though so large, finds ready market and is never greater, I understand, than the demand; for the American plate-glass can compete, both in quality and price, with that of European make. At Creighton, a part of the output is utilized in the manufacture of mirrors, and improved bevelling machinery has been introduced in order to give the glass the desired finish.

[1] Portion of a lecture by Prof. C. Hanford Henderson, delivered before the Franklin Institute, and printed in the *Journal* of that society.

PNEUMATIC PARCEL-DELIVERY FOR NEW YORK.

From the Pedestal of the Washington Monument, Richmond, Va.

IT looks now as if the next great enterprise that is to distinguish New York and add to her triumphs is to be an underground parcel-express, writes Julian Ralph. Though nothing has been made public about it before this, the inventions have been perfected, the patents are taken and the company is practically formed. All our bundles are to be whirled under our feet by the agency next in speed to lightning, and the projectors expect to make a mint of money out of the venture, for they have estimated the amount of business in parcel-carrying now transacted and they expect practically to monopolize it by reason of the cheapness with which their system will enable it to be done. The pneumatic parcel-posts of London and Paris are an immense convenience and an assured success, but they are very crude and expensive, and Yankee brains have been at work for years in an endeavor to develop the European idea into something worthy of American progress and economy.

The troubles with the Paris and London systems are many, but the greatest one is that parcels cannot be sent directly to their destination on either of these lines. The London Company, for instance, maintains a ten-inch tube worked by exhausting air, and broken at certain distances for stations. If a carrier, or box, is loaded with parcels for stations C, E and G, it must stop at every station; first at A, then at B, then at C, and be sent on from each station to the next, the man at each station taking out what he

finds in it for his place and sending on the rest to the next man, and so on to the end. This is altogether too crude for Yankeeland. The Western Union Company some time ago established a pneumatic service of its own for sending messages singly or in bundles from the branch stations to the main office, and for supplying the daily newspapers with their Associated Press telegrams and special dispatches, and they carry on an enormous business with little inch-and-a-half pipes, but they overcome the clumsiness of the European system by the expensive course of using separate tubes for each station and newspaper. Of course, that offers no solution of the problem for a general public service, and the New Yorkers who have received the profit there would be in a better system inclined their experiments from the first toward a wholly automatic arrangement based on the European plan.

They saw at once that the Old World plan could be improved on by signaling along the route to have all stations closed except the one to which a box was to be sent, but that was not half enough, and they kept on until to-day they say they have reached a higher degree of efficiency in their invention than is attained by the quadruple telegraph system, whereby four messages may be sent to different places on one wire. By arranging an automatic correspondence of mechanism between the boxes and certain appliances in the tube they claim to be able to start any number of boxes simultaneously, each to a separate station, with a certainty that each one will go to its destination of its own accord without any signaling or delay or possibility of mishap. After all, that is no more than is done with the cash balls and boxes on the hanging tracks in the ladies' shopping stores, and not half as marvellous as the sending of messages in opposite directions on one wire by telegraph.

But that is not all. The London tubes are only ten inches in diameter, and do not carry more than twenty-five pounds each, it is said. The New York tubes will be sixteen inches in diameter, with boxes of a capacity of one hundred pounds, or sufficient to take almost any parcel that a man would be likely to carry. The projectors estimate that the shopping stores alone spend something like $100,000 a day in wagon and messenger service for delivering purchases to customers' houses, and that is outside of the smaller traffic of the same sort, the miscellaneous parcels handled by the express companies and by individual citizens, district-messengers and all the rest. And the great moral they draw for their own satisfaction is that at present, by any and all these means, it takes as long to get a parcel anywhere in town as it does to send the same thing to Philadelphia. The motive power the company will use will be the exhaustion of air, as of old, and it will employ a messenger-corps at each station to carry the parcels to the houses.

BOOKS AND PAPERS

ANYTHING which admits one to the private life of a great man is sure to be welcomed by the public. A biography compiled chiefly from private letters must be poor indeed which is not read with interest. Most people, who have even a fair education and average imagination, will write private letters to their friends which are always interesting, if only from the fact that they are personal. It is only when one is on his good behavior, so to speak, or when one is preparing to deliberately edify that indefinite factor, the public, that literature becomes a burden, to reader and writer alike. This is made peculiarly manifest in the recently published biography of Horatio Greenough.[1] The book is composed almost entirely of private letters from the sculptor, and is most unexpectedly interesting, considering how really uneventful his life was. Written in any other form the biography might easily have become tedious. It is the personality of the artist, the bits of private life, the half revealed inner character which give the book its value. After all, we most of us are gossips at heart, and it is a satisfaction to know that others think and act as we do on occasions, and are just as prone to indulge in the commonplace. For instance, in a letter from one of the family, we find this allusion to the youthful occupations of the man who was to become one of the first artists of the country. "Ask Horatio if he recollects his first workshop — the well-curb turned sidewise, where he and you read the '*Life of Benvenuto Cellini*'? When tired of his constrained position he would get out and fire corncobs at the yellow cats in the field; and do you recollect your descent from the top of the barn with an umbrella? You were boys, indeed!"

The introduction begins by stating a very good *raison d'être* for the work. "The struggles of genius to make itself known are always interesting; therefore, though suppressing many confidences in depression and elation, there is enough left so show a determination to succeed, and an honest pride in surmounting obstacles." We cannot, however, but regret that Mr. Greenough's artistic struggles occupy so small a portion of the volume, for as a history of his art-growth it is very fragmentary and quite incomplete. But possibly it is best so. Criticism or even analysis belongs more to the essayist than to the biographer, and if the book fails to more than hint at his art-life, it fully atones for the omission by illustrating his first artistic impulses, and states some facts which we dare say are not known to the majority of our readers. "When Greenough was twelve years old, Mr. Shaw, then sole director of the Atheneum, gave him access to the fine-art room, with the promise of a bit of carpet on which to cut his chalk [the material in which he then worked] whenever he wished to be there! Solomon Willard showed him how to model in clay. Alpheus Cary, a stone-cutter, gave him insight into cutting marble; and he profited by the counsels of Binon, a French artist. To Dr. George Parkman he was indebted for anatomical knowledge."

While a student at Harvard he designed the Bunker Hill Monument, making a model for it in wood which was adhered to in execution, though the internal arrangements were altered. In later life, in the course of an essay which he wrote on the subject of art, he said: "The obelisk has, to my eye, a singular aptitude in its form and character to call attention to a spot memorable in history. It says but one word, but it speaks loud. If I understand its voice it says, 'Here!' It says no more. For this reason it was that I designed an obelisk for Bunker Hill." In view of the many objections which have been found of late years not only against the Bunker Hill Monument but against obelisks in general as fitting types for national memorials, it may be well to remember Greenough's line of argument in defence of his design, which after all, is quite as logical and conclusive as any of the canons which we hear so dogmatically asserted nowadays. Perhaps the safest way in such discussions is to fall back on the old school maxim, "*de gustibus non est disputandum.*"

We know that Greenough's art life was not altogether happy, notwithstanding the numerous and important commissions, both private and public, with which he was honored. He never felt overkindly towards the Government at Washington. The money due him on his statue of Washington was not paid until some years after his death; and in a letter to Hon. S. A. Eliot, dated 1851, he says: "I am well pleased with the grounds on which the President objects to my exhibiting the group in London. My object in sending it there was not gain, but a desire (I trust excusable) to show my work to Europeans, before whom, of course, I could not expect to pass for anything more than I deserve. This desire was the more excusable if it be remembered that the first great work I executed it was proposed to throw into the river Potomac,—a proposition which I believe never would have been made had that statue been seen in England before going to America. I do not wish to lay any great stress on the crude opinions expressed at that time of such a work of statuary. Those men had not, neither could they have any adequate conception of the scope of my art, of its difficulties, or of the other productions of ancient sculptors, with whose works those of modern artists must stand or fall."

Apparently, United States Congressmen have not improved very much in their feeling for art since 1851.

That Greenough's judgment was not warped by the crude architectural ideas of his contemporaries is well illustrated by the following fragment of a letter to Robert C. Winthrop, Esq., written in 1844 as a protest against the refusal of the Government to provide adequate accommodation for his "Washington."

"In order to show you, my dear sir, how far we are from consistency in relation to expenditures of this kind, I beg you to reflect on the amount expended by Government on colonnades,—mere display of the pomp of straight shafts of stone. Compare these with the sums voted for art, and you will see how far we are from economy on the one side and true architectural beauty on the other. I do not wish to disparage the public buildings, but I have travelled much, and I know of no capital where larger amounts have been spent with less effect. The Capitol, with all its faults, is imposing, and the Post-Office is beautiful. I wish to show only that we have learned to vote columns to the tune of hundreds of thousands, while statues seem to us useless luxuries. Look, I pray you, at the Girard College! I could scarcely believe my eyes when I saw so stupendous a display of material and workmanship covering a few Quaker-looking square rooms. It was like seeing the Pitt diamond on an Indian squaw."

In reading these letters one obtains incidentally some interesting glimpses of Boston as it was fifty years ago. In 1830 a letter from his brother states the fact that there was a bachelors' ball at the Exchange, and "the rooms were lighted by gas, introduced for the occasion." And in the same letter the writer says that Greenough's father was the only real-estate dealer in the city. In another place the same brother voices the current feeling for architecture at that time. "But how inferior an art to painting is architecture, and how can we compare the one, whose object is to influence the mind, to rouse affections on subjects of the highest importance, to call forth the most refined feelings, and to imitate the beauties of Nature, to the other, which has only the 'ordinary marshalling,' as Bacon says, 'of a man's apartments and the pleasing of the eye, for its aim'? Yet architecture can be studied to advantage in connection with the other arts."

Somehow we are now strongly inclined to reverse the last statement, and say that the other arts can be studied to advantage in connection with architecture.

In 1843 Greenough writes from Washington: "Poor Morse is here with his beautiful, his magical telegraph. How he contrives to keep alive the hope that they will vote him $30,000 now, when they propose to cut down West Point and reduce the salaries in the navy, I know not."

There are some clever bits of epitomizing in a few of Greenough's letters. In one place he writes: "Dear, compact, bird's-eye,

[1] "*Letters of Horatio Greenough, to his brother, Henry Greenough*," with biographic sketches and some contemporary correspondence. Edited by Frances Boott Greenough. Boston: Ticknor & Co. 1887.

cheap, quiet, mind-your-own-business, beautiful Florence, how does my heart yearn for you! There stand your bell tower and your Palazzo Vecchio. What care I for those who inhabit you? There will I build my church!" Could anything be more vivid to describe that delightful city? And again, writing of Vienna: "This town is clean and well paved, and impresses a stranger very much, with the imposing avenues, the huge public establishments, and the evidences of a great metropolis. The houses are not nice inside. The Government broom cannot reach beyond the front door, and the people are not neat in Germany, — at least, not here. The monuments are below mediocrity, the architecture rococo. The cooking is admirable; the puddings and pies all that one could desire, the fruits delicious. Smoking is universal, and the language infernal."

Altogether, the book is an interesting and valuable addition to our biographical literature; while the letters, though somewhat lacking in real information about the art-life of the sculptor, are well selected and very readable.

SOCIETIES

ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE Twenty-first Annual Convention, A. I. A., will take place in Chicago on Wednesday, Thursday and Friday, the 19th, 20th and 21st October ensuing.

In advance of the detailed programme which, as soon as some points in abeyance are decided, will be issued by the Committee of Arrangements — Messrs. W. L. B. Jenney, E. T. Littell, Henry Lord Gay, and the Secretary — the undersigned wishes betimes to call special attention to the occasion, which promises to be one of great interest and enjoyment. The architectural development of the great City of the Lakes, particularly perhaps, in its business buildings, has of late years been very notable; and will be seen under the best auspices; the Illinois State Association of Architects having passed a resolution expressing its "great pleasure in extending to [us] a hearty welcome," and having appointed a committee to act in concert with a corresponding Committee of the Chicago Chapter of the Institute "in providing a suitable entertainment to the invited guests."

The Western Association of Architects have appointed their President, Mr. Root, their Secretary, Mr. Alexander, and their ex-President, Mr. Adler, as their representatives at our Convention: and on a recent official occasion, the first alluded to it as one "which may pave the way to some possible union of the two associations, which will be a benefit to all," and the last as "an occasion which we may hope to see bring the Institute into closer relations with the Western Association, possibly resulting ultimately in both associations forming under one organization."

The Secretary has been in correspondence with some of the most prominent practitioners in the country in reference to getting brief practical papers, treating of important buildings or other architectural subjects with which their experience has rendered them familiar, and has already the promise of several. In addition to these there will be presented the opening address of President Thomas U. Walter, LL.D., the annual reports of the various Chapters, and of the Board of Trustees, and Standing Committees, as well as several proposed amendments to the by-laws, and other routine matter.

It is proposed also to collect illustrations of the works of members, for exhibition, first at the Institute Convention, and afterwards — by request of the Western Association of Architects — at their Convention in Cincinnati, opening 16th November ensuing. The illustrations may include any form of rendering: whether drawings, photographs, photogravures, or the results of any other of the various processes in vogue, and whether in whole or in part of the work delineated, but only such as represent work executed within the last ten years are desired.

The undersigned will be glad to hear, at the earliest possible moment, from members as to what illustrations they propose to send; as, also, from those to whom he wrote under date of 10th August, in relation to the professional papers before mentioned; and, in view of inquiries made by some of the latter, he wishes to repeat that a short paper will be preferable to a lengthy one: and, that when there is only leisure for a mere statement of the paramount requirements of the subject suggested, it will be entirely acceptable; nor is it essential that the papers be forwarded before October 12, though it will be convenient to have them earlier.

Referring to his letter, also of 10th ultimo, to the Presidents and Secretaries of the various Chapters, the undersigned begs to remind them of the suggestions therein made.

Any reports or communications for the Committee of Arrangements, which cannot be mailed in time to reach the Secretary, in New York, by October 15, may be forwarded to Mr. H. L. Gay, 15 East Washington Street, Chicago.

A. J. BLOOR,
Secretary, A. I. A.

COMMUNICATIONS

A DISPUTED COMMISSION.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — We write to you relative to certain decisions which may have been rendered from time to time. We have a case now in the Circuit Court pending which we brought against a client, as follows: We made the preliminary sketches and studies for a person for two houses, but we had no written contract, simply a verbal arrangement. The sketches for the one house were, however, accepted, but before we commenced the drawing he found some other person who proposed to make the drawings cheaper than we had agreed to do it; therefore he delivered to them our sketches, and they went ahead (and copied our sketches), and made the drawings. Upon learning these facts we presented our bill, payment of which was refused, and hence we brought the suit and got a judgment for the full amount claimed, and he appealed to the Circuit Court, and we shall be pleased to get a decision. Now we want to make the best fight we can, and if you have any knowledge of any reports of any decisions having been rendered, we shall be under obligations to you if you will cite them to us. We shall be pleased to hear from you at an early day. Very respectfully, X AND Y.

[We do not know any recorded cases similar to this, and hope to be fully informed as to the result of the appeal. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

A CASE OF SPONTANEOUS COMBUSTION. — One of the most curious instances of spontaneous ignition on record is that recently reported to *The Iron Age* by a Chicago manufacturer of plane bits. For some time a sponge had been used for wetting an emery-wheel in his shop, bringing water up out of a water-box by capillary attraction, and touching the wheel. It was kept against the wheel lightly by a spring. The wheel was used in grinding very hard steel plates, therefore the sponge constantly wiped particles of steel off the wheel during its revolutions, and it was used in that way until these particles had filled up its cells to a very considerable degree, of course being wet all the time. It was then laid aside, the string being still attached to it together with a little cotton cloth. In time it became entirely dry, lying on and against a couple of pieces of fine wood. After lying unobserved for a week or ten days, it was suddenly discovered one afternoon to be incandescent — in fact, a living coal — and to have set fire both to the board on which it rested and the one against which it leaned. It had burned a considerable portion of the stout twine and the cotton cloth attached to it. All were smouldering, and although flames had not burst forth, they evidently would have done so in a short time, as the room contained a very pungent smell of burning wood. The boards were each burned to a depth of a quarter of an inch and to a width approximately three inches when the incipient conflagration was quenched. The appearance of the charred sponge was not much unlike that of a piece of roasted iron ore, which it differed from, however, very decidedly in weight, being quite light. When broken it exhibited the same characteristics throughout, showing that the fine particles of steel had been thoroughly distributed in its interior. This evident case of spontaneous ignition of an article which had not been saturated with grease or oil, but which consisted of a piece of ordinary sponge, filled with fine particles of steel while it was in a wet state, naturally caused much discussion, but a very plausible explanation of its mysterious behavior has been made by the manufacturer himself, as follows: The particles of steel which were wiped off the emery wheel by the sponge must necessarily have been exceedingly fine, as the steel was very hard. Lodging on the sponge in a wet condition and in constant contact with water, oxidation was active — or, in other words, the particles rusted very rapidly. The fine particles of steel presented an extremely great surface area for such action as compared with their bulk. Under ordinary circumstances, oxidation does not develop sensible heat, but under the peculiar conditions here realized, the usually harmless chemical phenomenon of rusting developed into an actual fire-creating agent, and incandescence resulted. Here was an article which at first sight would seem to be as incapable of spontaneous combustion as an ordinary brick, but which proves to be entitled to rank with greasy rags and oily waste, and other well established fire-creating combinations. Had not this burning mass been discovered most auspiciously, a serious conflagration would, in all probability, have ensued, and its cause would have been "unknown." — *Fire and Water.*

A MOSCOW THEATRE FIRE. — "For marines" and others a writer in the Vienna *Allgemeine Zeitung* describes the following possible episode in the life of Colonel Sudeikin, the St. Petersburg Chief of Police, whose assassins were but recently sentenced to death. "On a Saturday in the first weeks of the year 1883," he writes, "'La Périchole' was performed in the Demidoff Theatre at Moscow. I had a seat in the first row, directly behind the orchestra, and next to me sat a police officer who seemed to know everybody. It was Colonel Sudeikin, a handsome young man of elegant appearance, whose faultless military dress was very becoming to him. A singer had just finished the famous romanza of the letter when a flame was seen to shoot up between the wings on the left side. 'Fire!' I called to the police officer. 'We are lost, sitting as we do behind the orchestra, far from the exits, in this wooden structure.' 'Don't budge,' he called, drawing a revolver with one hand and violently pressing my arm with the

other, simultaneously jumping upon his seat. Menacing the crowd with his weapon, he called in a voice of thunder: 'In the name of the Emperor, let everybody remain in his seat!' And now I witnessed a most remarkable scene. On the one side there was a stage wrapped in flame and smoke, on the other an immovable mass of people, chained to the ground by the word of a single man who had invoked the magic of the Imperial name. All this had occurred with the rapidity of lightning, for that courageous and cool-blooded man knew well how precious every moment was. '*Garodovoi*,' he called to the policeman guarding the doors, 'assist the audience out!' Then, one after the other, those whom the *Garodovoi* touched with the fingers, rose and left. Boxes and rows of seats were emptied almost noiselessly. Behind us, who stood with our backs to the stage, musicians and actors had long ago fled, and above us the ceiling was burning. I was seized with a desire to flee, but as a Frenchman I did not want to show less courage than the Russian police officer; and I was, moreover, convinced that, had I made the attempt to save myself, he would have shot me down as he would have shot any one else — a surmise the correctness of which I learned from him the next morning. When we finally reached the door the theatre had been emptied so quietly that it was possible even to remove coats and furs from the cloak room into the open air. At the moment of our leaving the officer preceded me saying: 'As a stranger you may have the honor of having been the last to leave the building.' The whole occurrence which to me seemed endless, had lasted barely ten minutes. A quarter of an hour later the flames had completely devoured the theatre."

Blunders of Famous Artists. — The French artist whose picture in the last *Salon* showed the eccentricity of presenting a cavalier of the time of Louis XIV, armed with a modern revolver, was not alone in his anachronism. Some of the early painters were amusingly careless about such matters. Tintoretto, in a picture of the Children of Israel gathering manna, represents them as having taken the precaution of arming themselves with shot-guns. When Cigoli painted the aged Simeon at the circumcision of the infant Saviour, which picture is now in St. Petersburg, he remembered that aged men wear spectacles, and so placed these conveniences upon Simeon's nose. In a picture by Verrio, of Christ healing the sick, the bystanders are represented with periwigs. This ludicrous effect is equalled in Albert Durer's picture of the expulsion of Adam and Eve from the Garden of Eden by an angel wearing a flounced petticoat. The same artist, in his scene of Peter denying Christ, depicts a Roman soldier quietly enjoying a pipe of tobacco. Of all the artists who have sinned against propriety or probability the Dutch and Flemish have been among the most eccentric. In the Museum of Vienna there is a picture, "Christ Bearing the Cross," by Peter Brueghel the elder, which shows Christ carrying his burden, while a monk, crucifix in hand, exhorts the two thieves to die repentant. David Teniers, the younger, in his "Denial of St. Peter," in the Louvre gallery, represents Peter as a Flemish guardsman. The soldiers are playing cards at a table and the whole scene is thoroughly Flemish. A Dutch painter in a picture of the Wise Men worshipping the Holy Child, has shown one of them wearing a large white surplice and boots and spurs, and in the act of presenting to the Child a model of a Dutch man-of-war. Another Dutch artist in representing Abraham offering up his son, departs from the Scriptural account of the patriarch's "stretching forth his hand and taking the knife," and shows him as about to shoot Isaac with a blunderbuss. Jean Belin, in one of his pictures, represents the Virgin and Child listening to a performer upon the violin, and in another he has drawn King David playing upon the harp at the marriage of Christ with St. Catharine. Nicholas Poussin has represented the Deluge with boats at hand ready for use, and on another canvas, "Rebecca at the Well," is seen with Grecian architecture in the background. And in a picture representing "Lobsters in the Sea, listening to the Preaching of St. Anthony of Padua," the lobsters are red; although as yet, it is fair to presume, unboiled. A French artist has depicted the Lord's Supper, the table being ornamented with tumblers filled with cigar-lighters; and the Virgin Mary, in another work of the same nationality, is helping herself to a cup of coffee from a chased coffee-pot. But, drollest of all blunders is that which portrays the Garden of Eden with Adam and Eve in all their primeval simplicity, while near them, in full costume, is seen a hunter with a gun shooting ducks. The time for these absurdities on canvas has passed away. Nowadays the painter is severely archæological, and the exceptions to the rule of accuracy in such matters are infrequent. There were no art critics to swoop upon the old painters and expose their historical shortcomings in the newspapers, but woe to the artist of to-day who makes a mistake of a century or so in the details of his picture. He will be sure to see his blunder set forth in print and be smartly lectured for his ignorance. — *New York Mail and Express.*

The Gas-engine in Europe. — For large power, gas-engines are taking the place of steam-engines in some localities in Europe. It is stated, for example, that the works of Deutz, where Otto's gas-engines are being built, have for some time past employed large motors of this class for driving mills and factories, instead of the usual steam-engine. These gas-engines are used in connection with a special gas-making plant, and it is stated that whereas the average consumption of an ordinary steam-engine is three-and-one-fourth pounds of coal per horse-power, the corresponding consumption of the gas-engine is found to be not in excess of two-and-one-fourth pounds — a degree of economy which has induced several establishments to replace their steam-engines by large gas-engines. Among these works are the zinc rolling-mill in Oberhausen, where ten gas-motors supply an aggregate of two hundred and forty-four horse-power; the Mechern Berg Werk Verein, where seven motors supply an aggregate of one hundred and seventy-four horse-power; the Prussian company for the manufacture of powder in Schlusseburg, where seventeen motors supply an aggregate of one hundred and ninety-four horse-power; a sugar factory in Elsdorf, where six motors supply an aggregate of one hundred and ninety-one horse-power; and there are several municipalities which have resorted to the same means for public purposes. — *Boston Transcript.*

Theatre at Buenos Ayres. — Buenos Ayres is to have a large theatre, covering 13,000 square metres of ground, which will contain 112 boxes and three galleries, and accommodate 4,000 spectators. The stage exclusive of the proscenium is to be forty-five metres deep, almost rivalling that of the Scala at Milan. The cost of the building is estimated at $3,000,000. A model constructed by the engineer Ciachi of Milan has been shipped to the President of the Argentine Republic. — *New York Evening Post.*

A New Use for Old Bricks and Mortar. — A builder in Newburg, N. Y., who is tearing down a building to make room for a new one, is putting the old brick and mortar of the building to a novel use. He has contrived a grinding machine, into which he feeds the old brick and mortar, and it is ground into powder, or rather into building sand and cement, and the material will be used in setting brick in the new building. — *Boston Journal.*

TRADE SURVEYS.

The volume of business for August was the largest ever known, and for the eight months of this year the excess is stated to have been eight per cent over the volume of the same eight months last year. An enormous distribution is in progress, and it is not believed that it is in excess of actual requirements, or in excess of the capacity of consumers to pay. There is a little unsettled feeling in some quarters over the possibility that the jobbing interests may be encouraging or forcing a larger distribution than the country is ready for. A few really unimportant failures have given rise to this fear. Trade conditions are everywhere favorable. Petroleum is threatened with an advance because of a ten per cent falling off in production, which may be followed up by an organization of producing interests. The decline in the wool clip will not seriously affect textile interests, though a great outcry has been made by many manufacturers of narrow margins. The textile interests are prosperous. The distribution of products is very heavy. Stocks are light. Mill-capacity East and South is steadily increasing, and the winter and spring outlook is quite favorable. The coal markets all over the country have developed considerable activity this September. The anthracite production is gaining over last year. Western demand is particularly active. The newly-developed sources of supply are doing well, and a speculative feeling in coal territory is apparent, especially in territory adjoining new or projected railroad lines. The increased manufacturing activity is stimulating the fuel demand, but prices remain low, and no fluctuation is probable under the influences which now control the production and distribution of either anthracite or bituminous. The iron trade is vigorous, and prices are stationary. Crude output has returned to the spring limit. Mill consumption is higher than it has been for years. Merchant steel demand is very heavy. Car-making contracts are being scattered around freely, and all works are full. Locomotive-building is more active than a month ago. New roads are providing for capacity and rolling stock, and old roads are also heavy purchasers of not only engines and cars, but all manner of equipments. The American railroad managers are, as fast as they are able, imitating the example of English managers, and are doing their work more thoroughly, regardless of the greater expense. The projected railroad bridge work is out of all proportion to the projected work at former like dates. The bridge builders, however, find foreign beams creeping in here and there.

The extraordinary consumption of lumber has enabled manufacturers everywhere to maintain somewhat more remunerative prices than last year. The supply is equal to demand, but no more. Much money is tied up in lumber, and because it is in strong hands instead of in a multitude of weak hands, prices will continue firm. High prices are an impossibility in the nature of the case. Contracts for about twelve thousand cars will be given out within sixty days. Such an item as this, along with many others, helps to sustain lumber-trade prices. The lumber mills are very busy. Yellow pine and all hardwood shipments are increasing. Planing mills are also crowded, but prices are very low in most localities. Hardwood exports to Great Britain are falling off, but to South American ports are increasing. The American Forestry Congress convened this week in Springfield, Illinois. The latest reliable statistics concerning building operations in cities or towns are gratifying. The new lists of permits are large. Large buildings are projected, such as church, bank, railroad, and manufacturing establishment work. The higher prices for labor, material and money may be exerting some influence in retarding operations, but it is scarcely correct to attribute the greater display of conservatism to that cause. It would be premature to say that the rush of building is over even in the Eastern and Middle States. Evidences are not wanting that even here the activity will continue through next year. The great body of the people yet living in other people's houses have no other ready way of investing their earnings which have been enabling savings institutions and building and loan associations to make such favorable reports for years past. Nothing but a general and absolute panic will check the house-building fever or the construction of the great multitude of buildings which follow in the wake of industrial prosperity. The bettering of the condition of the masses will engage attention, and more and better house room is the greatest present necessity after comfortable subsistence is provided. Many do not give this movement in house-building full credit. The housing of the world's workers is the problem in hand, and they will ask no one's permission to do it. Investors who are shrewd enough to measure the strength of this desire will place their money in this channel, due regard being had for locality and all surroundings. In a comparatively brief period it will be as rare to discover a worker under a roof not his own as it now is to find him under his own roof. A house-building era is at hand that will not be interrupted by any cause. The prosperous building and loan associations will assume a more organized shape, and soon act together instead of as now in an isolated manner. The architects repeat their favorable predictions, and anticipate an unusually busy winter in preparation for next year's work. Builders have been remarkably busy in the West, and are engaged up to the close of the season. Real estate is not climbing to impossible prices, and town and city properties can be purchased at reasonable prices. The application of electricity as a motive-power to street cars is helping to simplify the problem of cheap and comfortable living by providing quick and cheap transit between distant points. The electricians are making rapid progress in practical directions, and are deserving the thanks of the practical men who are turning their success to such practical account, within the means of the great body of the people.